



AGRICULTURAL RESEARCH INSTITUTE
PUSA

J. Hector Barnes

THE BRITISH PHARMACEUTICAL CONFERENCE
THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION
OF BROADLY INTERCOURSE AMONGST PHARMACISTS

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This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1893, NEWCASTLE. 1864, BATH. 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER. 1870, LIVERPOOL.
1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL. 1876, GLASGOW. 1877, PLYMOUTH.
1878, DUBLIN. 1879, SHEFFIELD. 1880, SWANSEA. 1881, YORK. 1882, SOUTHAMPTON. 1883, SOUTHPORT. 1884, HASTINGS. 1885, ABERDEEN.
1886, BIRMINGHAM. 1887, MANCHESTER. 1888, BATH. 1889, NEWCASTLE-ON-TYNE. 1890, LEEDS. 1891, CARDIFF. 1892, EDINBURGH.
1893, NOTTINGHAM.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

Presidents:—

1863-4, 1864-5, H. DEANE, F.I.S.; 1865-6, 1866-7, Prof. BENTLEY, M.R.C.S.; 1867-8, 1868-9, D. HANBURY, F.R.S.; 1869-70, 1870-1, W. W. STODARD, F.C.S.; 1871-2, 1872-3, H. B. BRADY, F.R.S.; 1873-4, 1874-5, T. B. GROVES, F.C.S.; 1875-6, 1876-7, Prof. REDWOOD, F.C.S.; 1877-8, 1878-9, G. F. SCHACHT, F.C.S.; 1879-80, W. SOUTHALE, F.I.S.; 1880-1, R. REYNOLDS, F.C.S.; 1881-2, 1882-3, Prof. ATTIEF, F.R.S.; 1883-4, J. WILLIAMS, F.C.S.; 1884-5, J. B. STEPHENSON, 1885-6, T. GREENISH, F.C.S.; 1886-7, S. R. ATKINS, J.P.; 1887-8, F. B. BENGER, F.I.C., F.C.S.; 1888-9, 1889-90, C. UMNEY, F.I.C., F.C.S.; 1890-1, W. MARTINDALE, F.C.S.; 1891-2, E. C. C. STANFORD, F.I.C., F.C.S.; 1893, O. CORDER, NORWICH.

THE YEAR-BOOK OF PHARMACY AND TRANSACTIONS.

TABLE I. YEAR-BOOKS. Of papers containing the proceedings at the yearly meeting, and a report on the work of the Year-Book Committee.

The Conference annually presents a Year-Book comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the best companion of the Year, and an invaluable permanent reference for every chemist and druggist. The Executive Committee of the Conference trust that many of their friends and acquaintances will be glad to contribute to the Year-Book, and to the list of names and addresses of subscribers will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer of member. The Name and Address of each candidate should be written legibly, and forwarded to "The Asst. Secretary, British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

THE ANNUAL SUBSCRIPTION.

The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. The amount, which includes free delivery of the Year-Book, is 2s. 6d. for members residing within the Postal Union, and 3s. 6d. for those residing elsewhere. Orders should be sent to Messrs. "The High Holborn Year-Book," 4, Bedford Square, London, W.C.1. Orders may also be sent to Messrs. "The Pharmaceutical Conference," 17, Bloomsbury Square, London, W.C.1. To all members who have previously paid the Annual Subscription, "The 46st. Year-Book, Edit. Pharm. Conf.," 17, Bloomsbury Square, London, W.C.1, and to all others, who have not, the Annual Subscription, is posted as soon as possible after the 1st of December, and

Extra copies of the Year-Book and Transactions for 1870 and subsequent issues, will be sent to members on receipt of Subscription as above, for each to other members immediately on receipt of the subscription.

Honorary General Secretaries,
 { W. A. H. NAYLOR, F.I.C., F.C.S., London.
 { F. RANSOM, F.C.S., Hitchin.



YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1891, TO JUNE 30,

1892.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

TWENTY-NINTH ANNUAL MEETING

HELD AT

EDINBURGH,

AUGUST, 1892.

LONDON:

J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.

MDCXCXCII.

BRITISH PHARMACEUTICAL CONFERENCE.

INAUGURAL MEETING HELD AT NEWCASTLE-ON-TYNE IN 1863.					Local Secretaries (One).	
Years.	Places of Meeting.	Presidents.	Vice-Presidents (Four).			
1864	Bath . . .	HENRY DEANE, F.L.S. . .	{ Prof. BENTLEY, F.L.S. . .	{ R. W. GILES, F.C.S. . .	J. C. POOLEY.	
1865	Birmingham	HENRY DEANE, F.L.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ Prof. REDWOOD, F.C.S. . .	W. SOUTHALE, Jun.	
1866	Nottingham	Prof. BENTLEY, F.L.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. F. TYLER. . .	J. H. AHERTON, F.C.S.	
1867	Dundee . .	Prof. BENTLEY, F.L.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ SAMUEL PARK. . .	J. HODGE.	
1868	Norwich . .	DANIEL HANBURY, F.R.S. .	{ Dr. EDWARDS, F.C.S. . .	{ W. W. STODDART, F.G.S. .	F. SUTTON, F.C.S.	
1869	Exeter . . .	DANIEL HANBURY, F.R.S. .	{ Dr. EDWARDS, F.C.S. . .	{ W. W. STODDART, F.G.S. .	M. HUSBAND.	
1870	Liverpool .	W. W. STODDART, F.C.S. .	{ Dr. EDWARDS, F.C.S. . .	{ J. INCE, F.L.S. . .	E. DAVIES, F.C.S.	
1871	Edinburgh	W. W. STODDART, F.C.S. .	{ Dr. EDWARDS, F.C.S. . .	{ H. S. EVANS, F.C.S. . .	J. DUTTON (Birkenhead).	
1872	Brighton .	H. B. BRADY, F.R.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. INCE, F.L.S. . .	J. MACKAY, F.C.S.	
1873	Bradford .	H. B. BRADY, F.R.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. INCE, F.L.S. . .	T. GLAISYER.	
1874	London . .	THOS. B. GROVES, F.C.S. .	{ Dr. EDWARDS, F.C.S. . .	{ W. D. SAVAGE. . .	R. PARKINSON, Ph.D.	
1875	Bristol . .	THOS. B. GROVES, F.C.S. .	{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	M. CARTEIGHE, F.C.S.	
1876	Glasgow . .	Prof. REDWOOD, F.C.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	J. PETERMAN.	
1877	Plymouth .	Prof. REDWOOD, F.C.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	A. KINNIMONT.	
1878	Dublin . .	G. F. SCHACHT, F.C.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	R. J. CLARK.	
1879	Sheffield .	G. F. SCHACHT, F.C.S. . .	{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	W. HAYES.	
			{ Dr. EDWARDS, F.C.S. . .	{ J. WILLIAMS, F.C.S. . .	H. MALEHAN.	

1880	Swansea	W. Southall, F.L.S.	{ R. Reynolds, F.C.S. }	{ W. Ward, F.C.S. }	{ J. Hughes. }
1881	York	R. Reynolds, F.C.S.	{ G. W. Sandford, F.C.S. }	{ N. M. Gase. }	{ J. Sowray. }
1882	Southampton	Prof. Atfield, F.R.S.	{ R. Atfield, F.R.S. }	{ N. M. Gase, F.C.S. }	
1883	Southport	Prof. Atfield, F.R.S.	{ R. Atfield, F.R.S. }	{ Prof. Treharne, LL.D. }	{ O. R. Dawson. }
1884	Hastings	J. Williams, F.C.S.	{ T. Greenish, F.C.S. }	{ J. R. Young, F.C.S. }	{ W. Ashton. }
1885	Aberdeen	J. B. Stephenson	{ W. A. Radley. }	{ M. Cartwright, F.C.S. }	{ F. Rossiter. }
1886	Birmingham	T. Greenish, F.C.S.	{ S. R. Atkins. }	{ J. R. Young, F.C.S. }	{ A. Strachan. }
1887	Manchester	S. R. Atkins, J.P.	{ J. Bell. }	{ C. Evans, F.C.S. }	{ Chas. Thompson. }
1888	Bath	F. B. Benger, F.C.S.	{ E. B. Benger, F.C.S. }	{ M. Cartwright, F.C.S. }	{ F. B. Benger, F.C.S. }
1889	Newcastle-on-Tyne	C. Unney, F.L.C., F.C.S.	{ T. Bagley, F.C.S. }	{ C. Smith, Ph.D. }	{ H. Hutton. }
1890	Leeds	C. Unney, F.L.C., F.C.S.	{ F. B. Benger, F.C.S. }	{ G. S. Woolley. }	{ T. M. Clagie. }
1891	Cardiff	W. Martindale, F.C.S.	{ S. Plover, F.C.S. }	{ C. Smith, Ph.D. }	{ F. W. Branson, F.C.S. }
1892	Edinburgh	E. C. C. Stanford, F.C.S.	{ M. Cartwright, F.C.S. }	{ W. Martindale, F.C.S. }	{ Alfred Coleman. }
1893	Nottingham	Octavius Corder	{ S. Plover, F.C.S. }	{ C. Smith, Ph.D. }	{ Peter Bea. }
			{ M. Cartwright, F.C.S. }	{ A. Kinnis, Ph.D. }	{ C. A. Boulton. }
			{ W. Gilmore, F.R.S. }	{ J. C. Treharne, M.B., D.Sc. }	
			{ J. Laidlaw, Esq. }	{ J. R. Young, J.P. }	
				{ R. Fitz Hugh, Nottingham }	

1853 to 1880, Prof. Atfield, Ph.D., F.R.S.
 1853 to 1871, Richard Reynolds, F.C.S.
 1871 to 1884, F. Baden Benger, F.C.S.
 1880 to 1882, M. Cartwright, F.C.S.
 1882 to 1886, Sidney Plover, F.R.C.S.
 1886 to 1890, John Clagie, F.R.S.
 1886 to 1890, W. H. N. Branson, F.C.S.
 1890 to 1893, F. Ranson, F.C.S.

1863 to 1870, H. B. Brady, F.R.S.
 1870 to 1877, George F. Schacht, F.C.S.
 1877 to 1884, C. Ekin, F.C.S.
 1884 to 1888, C. Unney, F.L.C., F.C.S.
 1888 to 1890, W. Martindale, F.C.S.
 1890 to 1893, R. H. Davies, F.L.C., F.C.S.

Treasurers
 (One).

Honorary
 Secretaries
 (Two).

THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1893 will be held at Nottingham.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is *7s. 6d.* for members residing within the Postal Union. Further information may be obtained from

THE ASST. SECRETARY; BRIT. PHARM. CONF.,
17, Bloomsbury Square, London, W.C.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 279.

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ERRATA.

Page 91, line 12, for *Erection* read *Excretion*.

„ 95, line 3, for *uric* read *acetic*.

„ 183, line 20, for *felix* read *flix*.

„ 184, line 3, for *silvestris* read *sylvestris*.

„ 186, lines 27, 29 and 32, for *Anemonine* read *Anemonin*.

„ 204, lines 9 and 10 should read, "to which they would otherwise have succumbed."

In the Volume for 1891:

Page 278, lines 21, 22 and 23, for 10, 12 and 25 grams read 0.10, 0.12 and 0.25 gram respectively.

INTRODUCTION.

AMONG the numerous contributions to the scientific literature of the year, none perhaps have a greater claim on the attention of pharmacists than those dealing with improvements in the processes for the production of galenical preparations. The efforts which for some time have been made to attain definiteness of strength and full physiological activity in the case of a number of these preparations have been again continued in the past year; and this may be said particularly with reference to the valuable work done by Messrs. E. H. Farr and R. Wright on the solvent action of alcohol of different degrees of strength on some of the drugs used in making pharmacopœial tinctures. The latest researches of these authors are devoted to the tinctures of jaborandi, belladonna, stramonium, and cinchona. Their results show that jaborandi leaves yield a tincture of maximum strength by the use of a menstruum containing 50 per cent. of alcohol, and that a proportion of 0.1 per cent. of alkaloid may be fairly fixed upon as a standard for this tincture. Of the various processes for exhausting the leaves, continuous percolation is recommended as decidedly superior to the others. In the case of belladonna leaves, the directions of the Pharmacopœia, both as regards the alcohol strength of the menstruum and the process of extraction, are found to give a very satisfactory product. A menstruum of low strength seems to answer slightly better than one containing a large proportion of alcohol, but the differences resulting from such variations are insignificant. It is further shown that the standard of alkaloid-strength of this tincture, and likewise that of stramonium seeds, should be fixed not lower than .025 per cent. For the preparation of the last-named tincture, alcohol of 60 to 70 per cent. is stated to be the most suitable menstruum; but the product is not free from the disadvantages of losing its clearness on standing, and of becoming turbid on dilution, and it is found inferior in this respect to a tincture made from stramonium leaves with a 50 per cent. menstruum, which appears to show neither of these

defects. With regard to tincture of cinchona, alcohol of 70 to 80 per cent. is reported to give the best result, and to effect a more complete extraction of the active principles of the bark than is generally supposed. The processes of macero-percolation and continuous percolation are found to be about equally well adapted for the preparation of this tincture, and to be markedly superior to those of either single or double maceration. Mr. J. C. Umney has investigated the merits of the process for the production of tincture of ipecacuanha recently suggested by Mr. W. H. Symons, in which the powdered root is mixed with $\frac{1}{5}$ of its weight of a 10 per cent. solution of ammonia, and then extracted by percolation with a menstruum of low alcoholic strength. He finds that the use of alcohol of 10, 20, or even 30 per cent. yields unsatisfactory results, but that practically complete exhaustion of the drug can be attained by the use of either proof or rectified spirit. The last-named menstruum (rectified spirit) appears to be the most suitable, as the product in this case remains perfectly clear both on standing and on dilution with water. M. Van der Voorst calls attention to the great differences in the strength of tincture of musk of the various pharmacopœias, and the inconvenience arising from such variations. He also shows that in order to obtain a tincture containing the highest possible percentage of the active principles of musk, the alcoholic menstruum should not be stronger than 50 per cent.

Experiments on pepsin wine carried out by Mr. J. Clark seem to justify the inference that the small proportion of alcohol present in sherry wine does not appreciably affect the digestive power of pepsin, a view which is quite in accord with the conclusions arrived at by M. Bardet in 1888. The formula recommended yields a preparation of which 3 minims will completely digest 100 grains of coagulated white of egg in one ounce of water, acidulated with 5 minims of hydrochloric acid in less than thirty minutes at 130° F.

In a report on the purity of pharmaceutical extracts, Mr. W. Watson Will states that the occurrence of copper is still very common in these preparations, and that he found it particularly in all the green extracts examined, as much as .42 per cent. being present in a sample of extract of belladonna and .36 per cent. in one of extract of henbane. Mr. J. Moss has experimented on liquid extract of cascara, and arrives at the conclusion that by extracting the bark in a suitable manner with water only, a preparation of full activity, entirely free from nauseous taste and smell

and perfectly miscible with water, can be obtained. Suggestions on the same subject are also published by Mr. G. Spencer and Mr. N. J. Pritzker. A paper on extract of malt by Mr. J. Gordon deals with the application of this product as an emulsifying agent. An examination of a number of trade specimens of extract of belladonna by Mr. J. C. Umney reveals a great variation both in their physical characters and their alkaloidal value, an observation of no little importance to pharmacists. The trouble caused by the partial precipitation and very slow deposition of this extract in the preparation of *collodium belladonnae* by the B.P.C. process has induced Mr. M. Conroy to suggest a modified formula, in which the pyroxylin is added to an easily obtained and bright solution of the extract, instead of the extract being added to the collodium. Mr. A. G. Hendry has given his attention to the preparation of infusion of senega and acid infusion of roses, both in a concentrated form, and the formulæ suggested by him are stated to yield products which, when diluted with 7 volumes of water, fairly represent the freshly made infusions of the Pharmacopœia. The often-observed gelatinization of infusion of digitalis is attributed by Mr. W. Bräutigam to the action of a micro-organism.

The cause of the well-known instability of the official *liquor strychnine hydrochloratis* at low temperatures has been investigated by Mr. W. Duncan, who shows that the separation of crystals is due to an excess of hydrochloric acid, as the presence of even a very small proportion of this acid in the free state considerably lessens the solubility of the neutral salt. The correctness of this view is confirmed by Dr. B. H. Paul. The superiority of the neutral hydrochlorate over other salts of strychnine for pharmaceutical purposes is referred to by Mr. D. B. Dott in a paper read before the recent meeting of the Conference. An improved formula for *injectio morphine hypodermica* is proposed by Mr. J. G. Sharp. Mr. Hendry suggests various improvements in the process for the preparation of *liquor bismuthi et ammonie citratis*, having for their object the prevention of discoloration and of the liability to turn cloudy on keeping. A very simple and efficient mode of accelerating the dissolution of iodine in the manufacture of the tincture, liniment, and other official iodine preparations is described by Mr. W. G. Mackenzie. The lumpy appearance frequently noticed in the ointment of red oxide of mercury is attributed by Mr. F. Davis to a separation of the hard paraffin in consequence of too rapid cooling of the ointment in its preparation. It is therefore recommended to surround the vessel with warm water, and to stir

the contents now and then during the process of cooling. Some experiments recorded by Mr. Kunkel lead to the conclusion that during the preparation of mercurial ointment, small but appreciable quantities of mercury are volatilized and may find their way into the respiratory passages of the operator.

Carbo animalis purificatus forms the subject of a thorough and very ably conducted investigation brought before the Edinburgh meeting of the British Pharmaceutical Conference by Mr. J. Hodgkin. In this it is shown that it is absolutely impossible to prepare a charcoal of the degree of purity required by the British Pharmacopœia, and that attempts to even approach such a result would involve considerable expense and loss of decolorising power. It is therefore proposed to substitute for the theoretical ideal an article that can easily be produced and will give every satisfaction in practice. Full details for attaining this end are given in the paper.

Of the vegetable remedies discussed in the literature of the past year, but few can be regarded as new, the great majority having met with previous notices. Mr. E. Heckel directs attention to a new tenifuge, consisting of the fresh rhizome of *Ceratanthera Beaumetzii*, which is used under the name "dadigogo" on the West Coast of Africa. It appears to owe its anthelmintic action to an essential oil, and also to possess purgative properties due to a resinous constituent. Dr. P. W. Williams reports favourably on the value of *Cactus grandiflora* as a cardiac remedy, especially in palpitation arising from reflex irritation in dyspepsia. Very good results have also been obtained with this drug by Dr. J. Aulde, who considers it useful both in functional and organic affections of the heart, and free from cumulative effects. Confirmatory evidence of the anti-rheumatic action of the bark and root of *Ephedra vulgaris* is offered by Dr. Betchine, and similar properties are claimed for the bark of *Magnolia grandiflora*. The ripe seeds of *Melampyrum sylvaticum*, *M. arcense*, and several other species, are found to be capable of producing toxic effects owing to the presence of rhinanthine, which does not exist in these plants previous to the period of flowering. A very interesting account is furnished by Mr. C. Renson of the highly characteristic physiological properties of cangoura, a new convulsive poison from Salvador. Penghavar-djambi, the hair-like chaff of a *Cibotium*, is again recommended as a valuable hæmostatic, and stated to produce its stypitic effects by the mechanical action of its fine tubular hairs. Jambul, the seed of *Eugenia Jambolana* (*Syzygium Jambolanum*),

which has acquired a reputation as a remedy for diabetes, has been investigated by Mr. T. Stephenson, with reference to its arresting action on the diastatic fermentation of starch. A careful comparison, conducted on these lines, of old and fresh seeds, of the kernel and the pericarp, and of various processes for the production of medicinal preparations, leads him to the conclusion that only fresh seeds, freed from the pericarp, should be used, and that heat should be avoided in their extraction. The process of re-percolation with a weak alcoholic menstruum seems to be best adapted in the case of this drug. This research is an important one, and appears to throw light on the variable and conflicting results which have hitherto attended the administration of jambul. A Persian drug sold under the name of shukai, and stated to be useful as a remedy for palsy, melancholia, leprosy, and ague, is described by Messrs. W. Dymock and C. J. H. Warden; while muna muna, a plant enjoying a high reputation in Ecuador as an emmenagogue and uterine stimulant and as a cure for sterility, is reported upon by Mr. E. M. Holmes. The latter also supplies some interesting information respecting Pernambuco jaborandi (the produce of a new species of *Pilocarpus*), Aden senna (the produce of *Cassia holoserica*), and the origin and characters of Curaçao and Barbados aloes. Two samples of the so-called African copaiba have been examined by Mr. J. C. Umney, and found to resemble the copaibas of South America in their general characters. Under the title of "gum-barks" Mr. D. Hooper gives an account of a number of different barks possessing mucilaginous properties such as render them applicable for special purposes in medicine and the arts, for which the white of eggs would be employed elsewhere.

We may briefly allude here to a number of spurious drugs which have come under observation during the past year. A false variety of *Parreira Brava* from Bahia is reported upon by Messrs. F. A. Ringer and E. Brooke, who have investigated its chemical composition in comparison with that of the root of *Chondrodendron tomentosum*. The microscopical characters of the same drug have been studied by Mr. W. M. Holmes. A spurious ipecacuanha has recently been examined by Mr. T. H. Wardleworth, and proved to be the produce of *Ionidium Ipecacuanha*. Mr. E. M. Holmes gives a description of a false pellitory root, which he has been able to identify as the root of *Corrigiola telephijfolia*. A spurious white hellebore root, emanating from the West Coast of Africa, is dealt with by the same author. Two fictitious kinds of coto

bark have also been recently met with in the London market. M. Collardot directs attention to two new adulterants of saffron, one of which is powdered paprika, or "sweet cayenne," while the other consists of dried and artificially coloured shreds of onions. The recognition of adulterations in linseed and linseed oil-cake forms the subject of a report by Mr. J. v. d. Berghe. An account of an examination of an adulterated sample of balsam of tolu by Mr. R. H. Davies seems to indicate that an approximate idea of the proportion of common resin present as an adulterant may be obtained from the degree of acidity of the alcoholic solution of the sample. Mr. B. S. Proctor points out that the proportion of fatty oil found in commercial samples of powdered rhubarb is often considerably in excess of the quantity occurring naturally in the genuine drug.

Kola-nut has been re-investigated both from a chemical and physiological point of view. Mr. E. Knebel finds that the red colouring matter of this drug contains a glucoside, which on heating with water or dilute acids splits up into caffeine, glucose, and kola-red. He considers it probable, therefore, that in previous analysis the proportion of caffeine found was only that existing in kola in the free state, while the combined caffeine was weighed along with the colouring matter, and was thus overlooked. The decomposition of this glucoside is found to occur to some extent already in the nuts, in which it is brought about by the action of a ferment. The longer duration of the stimulating effects of kola, as compared with those of tea and coffee, is attributed by Mr. P. Boa to the presence of a very large proportion of starch and other soluble matter, entangling as it were the active principle, so as to render its absorption less rapid than in the case of tea and other substances containing but little starch or albuminoid matter.

The number of vegetable drugs which formed objects of chemical research during the year is, as usual, a very large one. A re-investigation of the rhizome of *Aspidium filix mas*, by E. Poulsson, brings to light the interesting fact that the crystalline and comparatively inert constituent hitherto known as filicic acid can be made to yield an amorphous body possessing all the anthelmintic and toxic properties of the rhizome or the ethereal extract. He regards the crystalline acid just alluded to as an anhydride or lactone of the amorphous one, and proposes that the name filicic acid should be transferred to the latter, this being the real active principle of the drug. This body is also stated by him to be well adapted for therapeutic purposes. The results of an

examination of the rhizome of *Aspidium athamanticum* are published by Mr. R. Kürsten. The claims of *Podophyllum Emodi* as a rival of *P. peltatum* have engaged the attention of Mr. J. C. Umney, who arrives at the conclusion that the Himalayan drug is not suitable as an alternative source of podophyllin resin, as the product yielded by it proves to contain a much smaller proportion of the active principle than that occurring in the resin prepared from the official rhizome. The results of analyses of unofficial parts of the ipecacuanha plant, by Mr. D. Hooper, show that both stem and leaves contain emetine, but not in such high proportion as to render these parts likely to displace the root from its position in medicine and commerce. Messrs. P. Arata and C. Gelzer have isolated a bitter alkaloid from the root of *Morrenia brachystephana*, the sap of which is employed in the Argentine Republic as a specific for deficient lacteal secretion. The root of *Aristolochia Argentina* is found by Dr. O. Hesse to contain two distinct alkaloids, while *Aristolochia Indica* has afforded indications of several basic principles to Messrs. Dymock and Warden. Sarsaparilla has yielded to Mr. W. v. Schulz a third glucoside, forming with the two others already isolated by Prof. Flückiger and Prof. Dragendorff a series of homologous compounds, and belonging, pharmacologically considered, to the group of saptotoxin. A toxic alkaloid has been discovered by Messrs. F. Schlagdenhauffen and E. Reeb in the roots and seeds of *Cynoglossum officinale* and *Heliotropum europæum*, another one by Mr. K. Fragner in the bulbs of *Amaryllis formosissima*, and a third by the same author in *Amaryllis belladonna*. The constituents of angustura bark have been further investigated by Messrs. H. Beckurts and P. Nehring, who furnish an account of four alkaloids, a bitter neutral principle, a glucoside, and a volatile oil. The proportion of alkaloid in a sample of false angustura bark has been determined by Mr. W. J. Smythe, who finds it to amount to upwards of 6 per cent., consisting of strychnine and brucine. Mr. E. M. Holmes reports upon nine specimens of valuable cinchona barks from New Granada, containing from 2.3 to 6.78 per cent. of pure quinine. The presence in Indian hemp of the volatile alkaloid cannabinine, discovered in 1881 (*Year-Book*, 1881, 453), is confirmed by Mr. H. F. Smith. The occurrence of fumarine in the leaves of *Glancium corniculatum* is pointed out by M. Battandier, and is regarded by him as an additional argument for the union of the order *Papaveraceæ* with the *Fumariaceæ*. A description of the poisonous constituents of timbo, and of the

processes for their isolation, is supplied by Mr. F. Pfaff. Discrepancies in the statements of different authors have induced Mr. H. C. Loudenbeck to re-investigate the composition of pichi, and the results obtained by him seem to disprove the presence of an alkaloid. He thinks it probable that the impure glucoside has been mistaken for an alkaloid. Messrs. W. Duncan and T. S. Tweedie show that there is no foundation for the statements that commercial Goa powder as met with at the present time is inferior in quality as compared with the drug originally imported. In a report on opium, Mr. H. Adrian points out that the proportion of narcotine in different samples shows much greater variations than that of morphine, and that a large percentage of one of these two bases may occur together with a small percentage of the other, and *vice versa*. He lays stress upon the importance of a proper ratio between these alkaloids, and suggests that opium should be required to contain 10 per cent. of morphine associated with not less than 2·5 per cent. of narcotine. Further processes for the assay of opium are recommended by Mr. A. Lambert and Mr. D. B. Dott. The great variation in the melting-point of different samples of cacao butter (which goes considerably beyond the range given in the B.P.) is shown by Mr. T. M. Clague to be referable to the application of different degrees of heat during the process of extraction. The chemical changes accompanying such variations remain yet to be determined.

Some of the active principles of plants have been further examined with regard to their therapeutic action. In a report on ouabaïn, Dr. J. Sailer states that this powerful poison, when given in very small doses, may often prove a useful substitute for digitalis, but that its greatest value will be found to consist in its power as a local anæsthetic, which is markedly superior to that of cocaine. It is also applicable as an emetic and purgative. Some peculiarities respecting the anæsthetic properties of cocaine are discussed by M. Bignon. M. Dupuy calls attention to the value of anemonin, the active principle of wood anemone, for the relief of cough in chronic bronchitis, and also as an emmenagogue. The favourable accounts given by Dr. Falk and others of the prompt action of hydrastinine in checking uterine hæmorrhages are further confirmed by Dr. P. Strassmann. Good hæmostatic effects are also ascribed to atropine, administered hypodermically in doses of 0·3 milligram. Gymnemic acid, the active principle of *Gymnema sylvestris*, is recommended by Dr. A. Quirini as an emetic in doses of 0·3 to 0·4 gram, and in much smaller doses as an effective vehicle for disguising the taste of

bitter drugs. Additional evidence respecting the efficacy of salicin in the treatment of influenza is afforded by Dr. E. B. Turner.

The therapeutic properties of salicylamide have engaged the attention of Dr. W. R. Nesbitt, who finds this compound to be superior to salicylic acid in its freer solubility, its quicker action, its greater analgesic properties, its freedom from taste, and in its being pharmacologically safer. Calcium salicylate is found by Dr. S. Torescu to be a useful remedy in diarrhoea and gastro-enteritis. A combination of salicylic acid and antipyrine is introduced under the name of salipyrine as an antipyretic, uniting therapeutically the properties of its two components. Salophene or acetylpara-amidosalol is another synthetic product recommended for acute articular rheumatism, and stated to be free from the objection of producing any ill effects. Still another antipyretic recently introduced is analgene, a combination of ortho-oxyethyl and mono-acetyl-amido-quinoline. Thymacetin, a derivative of thymol, bearing the same relation to the latter which phenacetin does to phenol, is described as a mild hypnotic, and as a prompt remedy for nervous headache. Under the names of hæmol and hæmogallol, two derivatives of the colouring matter of blood are brought under the notice of the profession by Prof. Kobert and Dr. Merck as valuable blood tonics. Gallacetophenone and tumenol, the latter of which is a compound obtained from some of the constituents of mineral oils, may be mentioned here as new remedies for skin diseases. The use of sodium thiophene-sulphonate for the same purposes is reported upon by Mr. E. Spiegler. Solutol and solveol are names given to two soluble compounds of cresol, of which the former is recommended as a disinfectant, and the latter both as a disinfectant and antiseptic. Solveol is stated to be much more efficient than carbolic acid, and much less poisonous. Euophen, another antiseptic of recent introduction, appears to be an iodide of isobutyl-cresol, and is offered as a substitute for iodoform.

The great solvent action of piperazine on uric acid has led to its introduction into therapeutics for the treatment of gout, gravel, and urinary calculus; and two reports will be found in this volume dealing with this subject. Further evidence as to its usefulness and freedom from ill effects will be awaited with much interest. M. Paul calls attention to the power of strontium lactate to cause the rapid and complete disappearance of albumen from urine, an important observation which is corroborated by M. Dujardin Beaumetz. The same salt is shown to be an excellent tannicide by M. Laborde, who also confirms his previous statements

with regard to the perfect harmlessness of strontium salts in general. The anthelmintic properties of naphthalin are borne out by Dr. Mirovich.

Pure and impure chloroform have been separately examined with reference to their physiological action by Dr. du Bois-Reymond, while the chemistry of the subject has been dealt with by Messrs. C. Schacht and E. Biltz, Mr. D. Brown, and Mr. M. C. Traub. The anæsthetic lately re-introduced under the name of pental, as preferable to chloroform on account of its inhalation being free from danger and unpleasant after-effects, is shown to be amylene, or trimethylethylene.

We pass on in the next place to a brief notice of some of the leading contributions to the chemistry of vegetable alkaloids and similar principles. Drs. D. R. Brown and W. H. Perkin have studied the action of potassium permanganate on cryptopine, one of the opium bases, and have obtained among other oxidation products a crystalline acid, identical in every respect with metahemipinic acid which has hitherto been obtained only from papaverine. In a further report on narcotine and hydrastine, Prof. E. Schmidt confirms the opinion previously expressed, that the former may be represented as methoxyhydrastine. He also corroborates the occurrence of a third alkaloid (canadine) in *Hydrastis canadensis*, which had been called in question by Prof. Power. The same chemist likewise supplies some additional information respecting the base associated with hyoscyamine in the root of *Scopolia atropoides*, for which he now proposes the name scopolamine. Its composition is represented by the formula $C_{17}H_{21}NO_4$. Dr. E. Merck shows that Dr. Hesse's atropamine is identical with apotropine, and that an alkaloid obtained by Messrs. Ladenburg and Roth from crude belladonnine is pseudotropine. Dr. W. Schütte publishes the results of his further investigation of the mydriatic bases of the *Solanacææ*, which was undertaken with the object of ascertaining which of these alkaloids actually occur or pre-exist in the plants. An examination of the alkaloidal constituents of extract of belladonna by Dr. L. van Itallie affords evidence that this preparation, like the leaves from which it was made, contained almost entirely hyoscyamine, and that therefore no change had taken place in the course of the manufacture of the extract. Mr. T. S. Dymond records the very interesting observation that hyoscyamine occurs in lettuce, this being the first instance in which this alkaloid, or any member of the group of mydriatic bases, has been found in a plant not belonging to or

connected with the order *Solanaceæ*. Java coca leaves are shown by Dr. F. Giesel to contain, in addition to cocaine and cinnamylecocaine, a small proportion of a new alkaloid, which is subsequently described by Dr. C. Liebermann as benzoylepseudotropéine. Upon hydrolysis, this body is found to split up into benzoic acid and a base identical with Prof. Ladenburg's pseudotropine. Further information with regard to the aconite alkaloids is furnished by Prof. Dunstan and Mr. J. C. Umney, who report that the root of true *Aconitum napellus* contains aconitine, napelline, and aconine, of which the first is crystalline and the two others amorphous. Indications have been obtained by them of the presence of a fourth alkaloid, which is amorphous and resembles napelline. The constituent which they describe as napelline, a name formerly applied to pseudaconitine and afterwards to an impure aconine, is stated to be quite distinct from aconine and not identical with the picraconitine of Messrs. Wright and Luff. The results previously obtained by the two last-named chemists with reference to the products of the hydrolysis of aconitine are confirmed by Prof. Dunstan and Mr. F. W. Passmore, in a paper on the formation and properties of aconine and its conversion into aconitine. It may be assumed therefore that aconine and benzoic acid are the sole products of the hydrolysis alluded to; and though the attempted synthetical formation of aconitine from these two bodies has only been partially successful, the conclusion that this alkaloid (aconitine) is benzoyleaconine is not left in much doubt. The identity of ulexine with cytisine, established a short time ago by Mr. A. Partheil, is now fully corroborated by Messrs. J. v. d. Moer and P. C. Plugge; and a like result is announced with regard to sophorine, a basic constituent obtained from the seeds of *Sophora tomentosa*. Mr. P. Spehr directs attention to the distinctive characters of the crystalline alkaloid ephedrine isolated by him from *Ephedra monostachya*, as compared with ephedrine and pseudophedrine from *Ephedra vulgaris*. Mr. E. Jahns has continued his researches on the areca bases, and has succeeded in discovering an additional member of this group, which he describes under the name guvacine. He further shows that both arecoline and arecæidine exist ready formed in areca nut, and that the latter base is not derived from the former in the process of extraction. Additional information is also published with regard to corydaline, chrysanthemine, lupanine, and the alkaloids of *Berberis aquifolium* and *Berberis vulgaris*. A series of experiments on the alkaloid of tea have been communicated by Mr. A. H. Allen to the

recent meeting of the British Pharmaceutical Conference, and deal, among many other points, with the difficulty of effecting a complete extraction of the caffeine for the purpose of its estimation. Quinine hydrochlorate is shown by Dr. O. Hesse to crystallize both in needles and in octahedra, the former containing two and the latter one and a half molecules of water of crystallization. The preparation of a very light quinine sulphate forms the subject of a paper by M. P. Carles, in which it is shown that when a few crystals of ammonium sulphate are added to a hot saturated solution of quinine sulphate and allowed to dissolve slowly, the quinine salt crystallizes in a very voluminous form. Directions for the preparation of quinine tannate are given by Dr. J. E. de Vrij.

M. J. Fouquet has compared the various active principles of digitalis occurring in commerce with reference to their therapeutic value, and finds those which are soluble in chloroform but insoluble in water, to be more active than those soluble in water and insoluble in chloroform. He considers the crystallized digitalin, which belongs to the former group, as the best of all. Schmiedeberg's soluble digitalin, which was supposed to consist of several distinct bodies, has been examined by M. J. Hondas, whose results lead him to infer that this substance is almost entirely composed of one glucoside only, viz., the digitonin of Schmiedeberg and Kiliani, for which he however proposes Nativelle's name digitaleïn. The correctness of this view is disputed by Mr. H. Kiliani, whose recent researches seem to indicate that the digitaleïn alluded to is a mixture of seven or eight different constituents, containing not more than 60 per cent. of digitonin. In his latest work on saponin, Dr. O. Hesse assigns to this body the formula $C_{32}H_{52}O_{17}$, and arrives at the conclusions that saponin and senegin are identical, and that the supposed varieties of the former obtained from various *Caryophyllaceæ* are all one and the same compound. The formula for frangulin, $C_{22}H_{32}O_9$, is now abandoned by Drs. T. E. Thorpe and A. K. Miller in favour of $C_{21}H_{20}O_9$, the one assigned to it by Schwabe. Commercial hydrocotoin, from paracoto bark, is found by Messrs. G. Ciamician and P. Silber to contain another substance, to which they give the name of protocotoin and the formula $C_{16}H_{14}O_6$. In connection with recent work on the chemistry of the tannins, we may here mention an observation by M. C. E. Quignet to the effect that both gallic acid and tannin can be completely converted into benzoic acid by suitable treatment with ammonia and zinc dust.

Much interest has been manifested of late in a constituent of oil

of lemon which has occurred in commerce under the names of "concentrated oil of lemon," "terpene-free oil of lemon," and "cital," and is reported upon by Messrs. Schimmel and Co., Mr. E. M. Holmes, and Mr. A. A. Barrett. It appears to occur in the oil to the extent of 6 to 8 per cent., to be about fourteen times as strong in flavour, to have a higher specific gravity and a higher boiling point than the ordinary oil, to be practically free from terpene, and to form a clear solution with alcohol of even very moderate strength. It is believed to be identical with geranialdehyde. Mr. W. Lloyd Williams calls attention to the possibility of complete optical inactivity in a sample of perfectly genuine oil of eucalyptus containing a fair proportion of eucalyptol. He explains this phenomenon as a consequence of the union of oppositely rotating constituents in equally balanced proportions. A good deal of additional information is conveyed by Mr. J. H. Maiden and Mr. E. M. Holmes on the different eucalyptus oils of commerce and the species of eucalyptus yielding them. With regard to the examination of these oils, Messrs. R. H. Davies and T. H. Pearmain arrive at the conclusion that the combined processes of fractionation and freezing, though very useful for distinguishing between oils rich and poor in eucalyptol, will hardly serve as an accurate method for estimating the proportion of this constituent. They further show that the salicylic acid test for the detection of turpentine is not of much value. The oils of cinnamon leaves and roots, of valerian, birch, lime seed, wintergreen, geranium, lavender, myrtle, pennyroyal, cloves and sabadilla have also met with notices in this volume, and a considerable amount of work will likewise be found recorded in connection with the terpenes.

The action of heat on milk has been investigated by Messrs. A. R. Leeds and E. P. Davis, who arrive at the conclusion that the advantage of a complete destruction of bacteria by boiling is counterbalanced to a great extent by the injurious action of the high temperature on the digestibility of the milk. They therefore recommend that, wherever sterilization may be required, the milk should be rendered feebly alkaline with lime water, and heated to 155° F. for about six minutes. The results of analyses of human milk by Mr. F. Klingemann show that after the administration of even large doses of alcoholic liquors to nursing women, not a trace of alcohol can be found in this secretion. M. L. Perdriz has made the interesting observation that a certain bacillus, which he has separated from some water in Paris, possesses the power of fermenting starch with the production of amyl alcohol. He does not

consider it unlikely that the fusel oil found in commercial alcohol is formed by the action of bacteria. The relative digestibility of different kinds of starch, and the influence of temperature, acids, alkalies, and alcohol, is dealt with by Mr. G. A. Grierson in a paper read before the British Pharmaceutical Conference. Attention is called by Messrs. R. H. Chittenden, E. P. Joslin, and F. S. Meara to the presence in pine-apple juice of a ferment having a powerful proteolytic action on meat, white of egg, etc., and possessing also the power of curdling milk like rennet. The occurrence of a diastatic ferment in many plants is confirmed by Mr. J. Wortmann, who declines, however, to regard its presence as a condition essential to the absorption or decomposition of starch. A short time ago, M. Lépine attributed the rapid disappearance of sugar from blood under normal conditions to the presence of a ferment, and stated that when this ferment ceases to exist in the blood, diabetes is produced. This subject has now been re-investigated by Mr. J. Seegen and M. Arthus, with the result of showing that this glycolytic ferment does not pre-exist in the circulation, but is formed after the blood is removed from the system.

Valerianate of zinc as used in medicine is evidently not a satisfactory preparation. An investigation of a number of commercial varieties of this salt by Mr. W. A. H. Naylor proves that this product is not of uniform composition, that it does not meet the requirements of the official tests, and that the valerianic acid used in its manufacture is prepared from an imperfectly purified fusel oil. In a further report on the double cyanide of zinc and mercury, Prof. Dunstan shows that a true chemical compound of the two cyanides exists, the composition of which is represented by the formula $\text{Zn}_4 \text{Hg Cy}_{10}$, but that this salt cannot be obtained in a pure condition owing to its liability to decomposition by water. M. H. Causse has continued his researches on the salicylates of bismuth, and finds that sodium chloride, like ammonium chloride, may be usefully employed for retarding or entirely preventing the dissociating action of water on bismuth salts. Conflicting opinions are still entertained as to the nature of the decomposition suffered by silver chloride on exposure to light. In the latest contribution on this subject, Mr. H. B. Baker reports that the product of this change contains combined oxygen, and that in the entire absence of oxygen no darkening of the silver chloride takes place. The usual explanation of the cause of the very great difference in the relative solubility of pure and impure zinc in dilute acids is rejected as untenable by Mr. J. M. Weeren, in whose opinion the

comparative insolubility of the pure metal is due to the formation of a condensed layer of hydrogen on its surface, which prevents the further action of the acid. In the case of the impure metal, he considers that the hydrogen is evolved from the surface of the more electro-negative impurities, thus leaving the zinc exposed to the action of the acid. The interesting body known as hydrogen nitride, azoimide, nitrohydric acid, or hydrazoic acid, has been further studied by Mr. T. Curtius, who gives an account of a number of its salts. A compound of lithium and nitrogen obtained by direct combination, and answering to the formula Li_3N , is described by M. Ouyard. The direct combination of barium and carbon has been effected by M. L. Maquenne, whose experiments have resulted in the production of a compound of the composition Ba C_2 , possessing the interesting property of being decomposed by water with the evolution of acetylene and the formation of barium peroxide. Two compounds of iron and carbon monoxide, corresponding to the formulæ Fe (CO)_5 and $\text{Fe}_2 (\text{CO})_7$ respectively, are reported upon by Messrs. L. Mond and C. Langer. Attention is directed by M. Jaenicke to a combination of equal weights of borax and boracic acid, which is stated to be much more soluble than either of its constituents and to possess the antiseptic and pharmacological properties of boracic acid. An improved process for the preparation of solution of chlorinated soda is recommended by MM. Herison and Lefort.

We devote the remainder of this introductory chapter to a brief survey of some of the analytical processes published during the year. A very simple method for the approximate assay of chlorine water is suggested by Dr. L. Winkler, and is based on the observation that 50 grams of this preparation, if of the required strength, form a colourless mixture devoid both of free iodine and free chlorine, with a solution of 0.16 gram of potassium iodide. Referring to the volumetric estimation of zinc by means of potassium ferrocyanide, Mr. L. Blum proposes the previous removal of manganese, iron, and the alkaline earths, by treatment with bromine water, ammonia, and ammonium carbonate. The separation of copper and cadmium is effected by Mr. H. N. Warren by precipitating the former at the boiling-point with solution of glucose in the presence of sodium hydrate and an excess of Rochelle salt. The same object is attained by Mr. J. S. C. Wells by decolorising the solution of the two metals with sodium hyposulphite, and then precipitating the cadmium with sodium carbonate. Mr. O. Santermeister finds that Marsh's test cannot be depended upon for the

detection of arsenic in metallic iron, if applied in accordance with the directions of the German Pharmacopœia, since the arsenic may be wholly or partially left as an insoluble residue. A process for the detection of chlorides and bromides in the presence of iodides, described by Mr. D. S. Macnair, is based on the fact that silver bromide and chloride part with their bromine and chlorine on being heated with potassium bichromate and concentrated sulphuric acid, while no iodine is liberated from silver iodide under the same treatment. The action of iodine on phenols in alkaline solutions forms the basis of volumetric processes for the estimation of these bodies proposed by Mr. T. R. Carswell and Messrs. J. Messinger and G. Vortmann. Messrs. W. Autenrieth and O. Hinsberg show that phenacetin may be readily distinguished from acetanilid and antipyrine by its different behaviour towards hot, dilute nitric acid. The disturbing effect of phenacetin on the thalleioquin reaction of quinine has induced Messrs. F. Sestini and R. Campani to suggest a modification of the test by means of which both these substances may be detected in the presence of each other. Characteristic colour reactions for morphine, hydrastine, glaucine, and cytisine are described by Drs. G. Vulpins, E. Schmidt, D. Vitali, J. A. Battandier, J. v. d. Moer, and P. C. Plugge. A modification of the chromate test for strychnine, proposed by Messrs. R. H. Davies and O. Echenstein, has for its object the application of this reaction for the approximate quantitative estimation of traces of this alkaloid. A further report on the estimation of sugars by means of copper potassium carbonate solution is published by Mr. H. Ost. Mr. A. W. Gerrard shows that if Fehling's solution be made with double the usual amount of copper sulphate, and then employed with the addition of a certain definite proportion of potassium cyanide in a suitable manner, the estimation of sugar can be rapidly carried out without the occurrence of any precipitation of cuprous oxide, the completeness of reduction being thus sharply indicated by the disappearance of the blue colour. The sugar equivalent of this reagent is the same as that of ordinary Fehling's solution. Another method for the estimation of sugar, described by M. L. Maquenne, depends on the well-known reaction with phenylhydrazine. Various contributions to the subject of urine testing, and processes for the assay of commercial chemicals and technical products, will also be found in this volume.

CHEMISTRY.

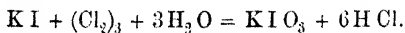
YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Preparation of Pure Hydrobromic Acid. W. Feit and K. Kubierschky. (*Pharm. Zeitschr. für Russl.*, xxx, 298.) Pure hydrobromic acid may be obtained from potassium bromide and sulphuric acid in the following manner:—100 grams of coarsely powdered potassium bromide (free from bromate) are gently warmed and shaken with 150 c.c. of sulphuric acid of 1.41 sp. gr. until the salt is dissolved. The liquid is slowly distilled until the temperature reaches 200° C., when the distillation is stopped. The product is then re-distilled, but only that portion collected which passes over at 126° C. The acid thus obtained is perfectly pure; it has a specific gravity of 1.49, and contains 48 per cent. of H Br.

Chlorine Water. L. Winkler. (*Pharm. Post.*, 1892, 477.) The author suggests a very simple and expeditious mode for the approximate assay of this preparation. 0.16 gram of potassium iodide is dissolved in a small quantity of water in a glass-stoppered flask, and to this solution 50 grams by weight of the chlorine water are added. If, after shaking, the mixture remains perfectly clear and colourless, the preparation contains not less than 0.4 per cent. of chlorine. Any liberation of iodine would indicate a smaller proportion of chlorine in the sample, while, on the other hand, the presence of free chlorine in the mixture after shaking would prove the sample to be superior in strength to the standard of 0.4 per cent. The reaction on which this test is based is represented by the following equation:—



Solution of Chlorinated Soda. M. Herison and J. Lefort. (*Comptes Rendus*, cxiii. 1042.) This solution is often prepared from chlorinated lime by decomposition with solution of sodium carbonate and subsequent filtration. The authors suggest the use of sodium sulphate in place of the carbonate for this purpose, as this yields a neutral instead of an alkaline product.

Solubility of Iodine in Chloroform. W. Duncan. (*Pharm. Journ.*, 3rd series, xxii. 544.) The results of a large number of estimations carried out by the author show that at 10° C. chloroform dissolves 1.77 per cent. of its weight of iodine, or in other words that one part of iodine is soluble in 56.6 parts of chloroform.

Fluorine. H. Moissan. (*Ann. de Chim. et de Phys.*, vi. 125.) The author supplies some further information with regard to the properties of the element fluorine, which he first isolated in 1887 by the decomposition of hydrofluoric acid by means of a powerful galvanic current. It is a pale greenish-yellow gas having a chlorine-like odour. Its atomic weight is 19, and its density as compared with air 1.316. It is a far more energetic supporter of combustion than even oxygen, and powerfully attacks all metals with the exception of gold and platinum. With hydrogen it combines with great violence, but it does not seem to have any affinity for oxygen. Its action on chloroform, alcohol, and other organic liquids is so energetic that it is difficult to avoid explosions.

Masrium, a Supposed New Element. H. D. Richmond and Hussein Off. (Abstract of a paper read before the Chemical Society, April 21st, 1892.) In the analysis of an Egyptian mineral, a variety of fibrous alum, the authors noticed the presence of a constituent having properties unlike those of any known element. Pending further investigation, they have provisionally named this body *masrium*, from the Arabic name for Egypt. From an analysis of the oxalate, on the assumption that it is a bivalent element, the atomic weight of "masrium" is calculated to be 228. The authors point out that there is a vacant place in the periodic system in the glucinum-calcium group for an element having the weight 225. In many of its properties "masrium" resembles glucinum; the oxalate is analogous to that of calcium.

A New Modification of Sulphur. F. Knapp. (*Journ. prakt. Chem.* [2], xliii. 305-320.) The author has investigated Magnus' "black sulphur," which is obtained by suddenly heating a mixture of sulphur and oil. Certain precautions are necessary to ensure a good yield, which are fully detailed in his paper. The pro-

duct contains about 56 per cent. of sulphur, of which 45 per cent. are expelled at a red heat, while the residue contains the remaining 10 per cent. of sulphur with about 34 per cent. of carbonaceous matter. This so-called "black sulphur" is not itself a modification of sulphur, but it contains the modification, adhering to a carbonization product of the oil which itself contains sulphur. This modification is unstable in the free state, but can readily exist in contact with any surface affording a substratum for its development. In thin layers it is blue, but in larger masses it presents a dull black appearance. The blue colour developed by sulphur on platinum and silver, the colour of ultramarine, and the momentary blue coloration produced on adding sulphuretted hydrogen to ferric chloride, are mentioned as manifestations of this modified sulphur. In the last-named case the want of permanency is attributed to the absence of a suitable surface for adhesion. On evaporating "black sulphur" with solution of potassium hydrate or nitrate, and likewise on evaporating a solution of sulphur vapour in potassium hydrate, blue rings are formed in the dish. Several other manifestations of a similar nature are mentioned.

Two New Modifications of Sulphur. R. Engel. (*Comptes Rendus*, cxii. 866-868.) On adding a saturated solution of sodium hyposulphite to twice its volume of hydrochloric acid with continual stirring at about 10°C ., and then filtering to remove the sodium chloride thus precipitated, a colourless filtrate is obtained, which soon changes to pale yellow and after a while to a deep yellow. If at this point the liquid, while still clear, is shaken with chloroform, the latter takes up the yellow colour, and upon spontaneous evaporation, it leaves orange-yellow crystals of sulphur, which fuse below 100° , and also differ from octahedral sulphur in shape and by their higher specific gravity. These crystals pass gradually into the state of amorphous insoluble sulphur.

If the solution of hyposulphurous acid in hydrochloric acid, obtained as above, is allowed to stand, another modification of sulphur separates out in the form of a flocculent yellow precipitate. This sulphur is soluble in water, yielding a yellow solution, which changes rapidly and deposits insoluble sulphur in an amorphous condition.

Action of Sulphurous Acid on Flowers of Sulphur. A. Colefax. (*Proc. Chem. Soc.*, 1891-92, No. 104.) Sulphurous acid acts on flowers of sulphur at the ordinary temperature of the air, and produces thiosulphuric acid and a polythionic acid, probably trithionic

acid. No pentathionic acid was found. According to Flückiger, sulphurous acid gave, by its action on flowers of sulphur, thiosulphuric acid. The presence of a polythionic acid is proved by a comparison of the iodine titrations and the acidity titrations before and after the addition of iodine requisite for the iodine titration. It is thus shown that there is present a considerable quantity of an acid having no iodine titration, and which is not merely oxidised sulphurous acid. Qualitative tests point to the presence of thiosulphuric acid, or trithionic acid, or a mixture of the two. Not even in the dark is sulphurous acid without action on sulphur. A higher temperature (say 80-90° C.) favours the action of sulphurous acid on sulphur; water has no action on flowers of sulphur, either at ordinary temperatures or at this higher temperature.

Action of Light on Silver Chloride. R. Hitchcock. (*Amer. Chem. Journ.*, xiii. 273-277.) The author has studied this action by exposing a very thin layer of silver chloride upon glass slips to direct sunlight for about four months. The loss of chlorine from one gram of the chloride was found to vary from 0.0821 to 0.0929. But even after that prolonged exposure the limit of this change was not yet reached. The quantity of metallic silver in the residue was found to be equivalent to the liberated chlorine.

Action of Light on Silver Chloride. M. Gunz. (*Comptes Rendus*, cxiii. 72-75.) Similar experiments to those referred to in the preceding abstract lead the author to the conclusion that the final product of the action of light on a layer of silver chloride usually consists of an upper layer of metallic silver, an intermediate layer of subchloride, and a lower layer of unchanged chloride.

The Action of Light on Silver Chloride. H. B. Baker. (Abstract of a paper read before the Chemical Society, June 2nd, 1892.) The results of the author's experiments afford proof that the darkened substance formed from silver chloride under the influence of light contains combined oxygen, and that its composition agrees fairly with that of an oxychloride of the formula Ag_2ClO . In the entire absence of oxygen, no darkening of the silver chloride was found to take place.

Cause of the Slight Solubility of Chemically Pure Zinc in Acids. J. M. Weeren. (*Ber. der deutsch. chem. Ges.*, xxiv. 1785-1798.) The author's experiments do not lend support to the usually adopted theory that the ready solubility of impure zinc in dilute hydrochloric or sulphuric acid is due to the electric currents set

up by the contact of the zinc with the metallic impurities, and that the absence of such currents in the case of chemically pure zinc accounts therefore for the comparative insolubility of the latter. The author finds that this insolubility is due to the formation of a condensed layer of hydrogen on the surface, which prevents the further action of the acid. In the case of nitric acid, this layer is oxidized by the acid as it forms, and cannot protect the surface of the metal. In the case of impure zinc and dilute hydrochloric or sulphuric acid, the hydrogen is evolved from the surface of the more electro-negative impurities according to the usual law, thus leaving the surface of the zinc exposed to the action of the acid.

Calamine. D. B. Dott. (*Chemist and Druggist*, February 27th, 1892.) The author has examined a number of samples of calamine from various sources. None were of the quality required by the Pharmacopœia, all of them containing insoluble barium sulphate, in quantity varying from 92.10 per cent. in the worst, to 29.17 per cent. in the best. Two of the samples contained no zinc in any form; the best contained 66.90 per cent. of basic carbonate of zinc. Calcium carbonate was present in some of the samples in considerable quantity. These results show that most of the calamine in the market is fictitious, as sulphate of barium is not naturally associated with native calamine.

Action of Ammonia on Zinc Chloride. W. Kwasnik. (*Archiv der Pharm.*, cexxix. 310-316.) On adding an alcoholic solution of ammonia gradually to an alcoholic solution of zinc chloride until the smell of ammonia becomes perceptible in the mixture, a white crystalline precipitate is obtained, the composition of which corresponds to the formula $\text{ZnCl}_2 \cdot 2\text{NH}_3$. It is a stable compound, insoluble in water and alcohol, but readily soluble in dilute acids, ammonia and fixed alkalis, in the latter case with elimination of ammonia.

Hydrogen Nitride (Azoimide). T. Curtius. (*Ber. der deutsch. chem. Ges.*, xxiv. 3341-3349.) The author has continued his researches on this interesting body (see also abstract, *Year-Book of Pharmacy*, 1891, 19), which is now also known by the names of *hydrazoic acid*, *imidazoic acid*, and *nitrohydric acid*. He has prepared a number of its salts, of which he describes the following:—*Argentio nitride*, Ag N_3 , *mercurous nitride*, Hg N_3 , *plumbic nitride*, Pb N_6 , *sodium nitride*, Na N_3 , *ammonium nitride*, N_4H_4 (or $\text{N}_4\text{H}_3\text{N}$), and *hydrazine nitride*, N_5H_5 . For particulars, reference should be made to the original.

Combination of Borax and Boracic Acid. M. Jaenicke. (*Pharm. Post.*, October 4th, 1891, 809.) By boiling equal weights of borax and boracic acid with water a compound is obtained possessing the antiseptic and pharmacological properties of boracic acid, coupled with the advantage of being much more soluble than either of these two chemicals alone. A saturated solution of this compound is therefore recommended as a valuable antiseptic.

Barium Carbide. L. Maquenne. (*Comptes Rendus*, cxiv, 361.) The author has obtained a compound of the formula BaC_2 by direct combination. It possesses the interesting property of being decomposed by water with the evolution of acetylene (C_2H_2). It stands heating to redness without suffering decomposition.

Purification of Carbon Bisulphide. A. Chenevier. (*L'Union Pharm.*, xxxiii, 204.) 0.5 c.c. of bromine is added to 1 litre of carbon bisulphide, and the mixture allowed to stand for 3-4 hours. The bromine is then separated by shaking either with copper turnings or with an excess of potash. After this the product is agitated with a small quantity of potassium chloride and filtered. It is then clear, colourless, free from any unpleasant odour, and leaves no residue on evaporation.

Lithium Nitride. M. Ouvrard. (*Comptes Rendus*, cxiv, 120.) Lithium is shown by the author to be capable of combining directly with nitrogen by being heated in a current of this gas. The compound thus formed has a composition corresponding to the formula Li_3N .

Action of Ferrous Iodide upon Filtering Paper. T. Salzer. (*Chem. Zeitung*, 1892, 421.) The purplish red coloration often developed in solutions of ferrous iodide after short exposure to air is traced by the author to the action of liberated iodine upon starch emanating from the filtering paper. The solution of ferrous iodide dissolves the starch during filtration without any immediate coloration; but as soon as any trace of iodine is liberated on exposure the purplish colour is produced. The starch in the paper is due in most cases to the presence of unruptured cells. In some instances it may be attributable to imperfect treatment with alkali and water, since the starch granules are not found in the original cells, but loosely attached to the fibres.

Compounds of Iron and Carbon Monoxide. L. Mond and C. Langer. (*Proc. Chem. Soc.*, 1891-92, No. 102.) The authors have isolated two compounds of iron with carbon monoxide, represented by the formulæ $Fe(CO)_5$ and $Fe_2(CO)_7$, for which

they propose the names Ferropentacarbonyl and Diferroheptacarbonyl.

Ferropentacarbonyl is obtained by exposing finely divided iron in an atmosphere of carbon monoxide at the ordinary temperature during about twenty-four hours, and then heating to about 120° . A small quantity (about 1 gram from 100 grams of iron) of an amber-coloured liquid is thus obtained, of the relative density 1.4666, which solidifies below -21° , forming acicular, yellowish crystals. The compound distils unchanged at 102.8° , the vapour having a density of 6.5, that corresponding to the formula $\text{Fe}(\text{CO})_5$ being 6.7. It is not acted on by dilute acids; nitric acid, chlorine, and bromine destroy it; alcoholic solutions of alkalis readily dissolve it, and form red-coloured solutions, which rapidly change in contact with air, but from which, as yet, no definite compounds have been obtained.

Diferroheptacarbonyl is obtained by exposing the liquid ferropentacarbonyl to light. It separates in gold-coloured crystals, carbon monoxide being liberated. The crystals are almost insoluble in all ordinary solvents; they are not volatile, but on heating to 80° they are decomposed into iron, ferropentacarbonyl, and carbon monoxide. The crystals are not changed by dilute acids, but are readily acted on by nitric acid, bromine, and chlorine. Alcoholic potash dissolves them, forming a red solution, very similar to the solution of the ferropentacarbonyl.

Iodide of Lead and Magnesium. R. Otto and D. Drewes. (*Archiv der Pharm.*, cxxix. 179.) This double salt, $\text{Pb Mg}_2 \text{I}_6 + 16 \text{H}_2\text{O}$, is described as forming pale yellow, exceedingly hygroscopic crystals, which on mere exposure to air are converted into a solution of magnesium iodide and a precipitate of iodine. It is prepared by saturating a hot concentrated solution of magnesium iodide (obtained from magnesium carbonate and hydriodic acid) with iodine, filtering whilst hot, and then allowing the solution to cool and crystallize. The crystals lose their water at 140°C. , and decompose at 150° with separation of iodine.

Allotropic Silver. C. Lea. (*Pharm. Journ.*, from *Phil. Mag.*, October, 1891, 337.) A further investigation of the phenomena connected with the reduction of silver salts under a great variety of circumstances has enabled the author to arrive at the following conclusions:—The reduction of silver may be direct or indirect; direct when it passes from the condition of the normal salt or oxide to that of the metal, indirect when the change is first to a suboxide or to a corresponding subsalt. When the reduction is

direct the metal always separates in its ordinary form, but when the reduction is indirect the silver presents itself in one of its allotropic modifications. The three principal modes of formation of allotropic silver are :—(1) Reduction of silver citrate or tartrate by ferrous citrate or tartrate; (2) action of dextrine and fixed alkaline hydrate on silver nitrate or oxide; (3) action of tannin and fixed alkaline carbonate on silver nitrate or carbonate. There is a well-marked tendency of acids to give rise to the formation of the yellow product and of alkalies to the blue. Hypophosphorous and phosphorous acids also appear to act like the organic reducing agents, but the colorations produced are only transitory, owing to the strong tendency of free mineral acids to convert allotropic into normal silver. If the action of indirect reducing agents be interrupted before it is completed, by addition of an excess of dilute hydrochloric acid, a dark purple-brown mixture of silver subchloride and protochloride is precipitated, suggesting that silver exists in its subsalts in the allotropic form, though the greater activity of allotropic silver and its lesser specific gravity indicate a simpler molecular constitution than obtain in normal silver.

A New Modification of Phosphorus. H. M. Vernon. (*Phil. Mag.*, October, 1891, 365. From *Pharm. Journ.*) The author's experiments show that there are two crystalline varieties of phosphorus differing in their melting-point and some other properties. The respective melting-points were determined in tubes containing a trace of water vapour to prevent oxidation, placed in air-baths surrounded by water at 100° C. The melting-point of one variety agreed with that recorded by v. Schrötter and other observers for octahedral phosphorus, 44·3° C., but that of the other modification was indefinite, and calculated from the latent heat curves is at least 1° C. higher. The two different varieties of phosphorus were both obtained from the same specimen, supposed to contain phosphorus all in the same state, and must therefore be easily convertible the one into the other. Experiment showed that the form assumed by the phosphorus depends upon the rate of the solidification of the molten substance. By rapid cooling solidification takes place at 43·8° C., and the variety with definite melting-point is obtained. But by slow cooling the temperature falls to about 30° before solidification commences, and then rises to about 43° C.; the product in this case consists principally of the modification with indefinite melting-point. As a single rapid or slow cooling of the melted phosphorus is not

sufficient to wholly convert the one modification into the other, but the total conversion can be effected by a single repetition of the process in slow cooling and by two or three repetitions in rapid cooling, it follows that the phosphorus when melted is also in a different state in the two cases. Up to the present it has been stated that phosphorus always occurs in octahedral or rhombic dodecahedral crystals, but careful examination shows that the variety with indefinite melting-point crystallizes in rhombic prisms from benzene, though measurements of the crystals could not be taken because of their inflammable nature. As observed with octahedral and prismatic sulphur, the two varieties of phosphorus differ in specific gravity, the octahedral variety having the value of 1.8177 and the prismatic 1.8272 at 13° C. The octahedral modification has also considerably greater latent heat than the rhombic variety.

Phosphorous Oxide. T. E. Thorpe and A. E. Tutton. (Abstract of a paper read before the Chemical Society, December 3rd, 1891. From the Society's Proceedings.) In this paper the authors continue their description of the properties of phosphorous oxide, P_4O_6 . In their first communication (*Trans. Chem. Soc.*, 1890, 553) it was stated that the oxide rapidly became red when exposed to light; they have since obtained phosphorous oxide in large well-defined crystals, unaffected by light, by repeatedly exposing a quantity of the freshly distilled oxide to sunshine for several months at a time, and decanting the melted oxide from the red phosphorus produced. Large crystals of the oxide may also be obtained by spontaneous sublimation in a vacuum, which remain unaffected by light, so long as they retain their crystalline form; but if they are melted by the warmth of the hand, and then allowed to cool to the wax-like form, reddening occurs on exposure to light. Hence it appears not improbable that the permanency of the crystallized oxide is in some way connected with its crystalline character.

The bulk of the paper deals with the behaviour of phosphorous oxide towards bromine, iodine, hydrochloric acid gas, sulphur, sulphur trioxide, sulphuric acid, sulphur chloride, ammonia gas, nitrogen peroxide, phosphorous pentachloride, and phosphorous trichloride.

The Double Cyanides of Zinc and Mercury. W. R. Dunstan. (*Pharm. Journ.*, 3rd series, xxii. 769.) When a solution of zinc sulphate is added to a solution of mercuric potassium cyanide ($Hg K_2(CN)_4$), or when mercuric chloride is added to a solution

of zinc potassium cyanide ($\text{Zn K}_2(\text{CN})_4$), a white precipitate is formed, which has been stated, on the authority of Gmelin, to consist of a double cyanide of zinc and mercury of the formula $\text{Zn Hg}(\text{CN})_4$. This the author has shown is not the case (see *Year-Book of Pharmacy*, 1890, 28). The precipitate loses a large quantity of mercuric cyanide when it is washed with cold water; some, however, remains attached to the cyanide of zinc. Previous experiments made by the author seemed to point to the conclusion that the mercuric cyanide thus retained is not chemically combined, but in some manner mechanically entangled by the zinc cyanide. This view is, however, disproved by further experiments, of which an account is now given.

The amount of mercuric cyanide "retained" by the precipitate is dependent on the amount of water present during precipitation, as well as on the proportion in which the salts react. The maximum quantity retained is 38.5 per cent.; and zinc cyanide having this percentage of mercuric cyanide attached to it in such a form that it cannot be removed by ordinary washing with cold water, is precipitated when cold saturated solutions of the reacting salts are mixed in equi-molecular proportions.

The washed precipitate is quite amorphous. Prolonged contact with cold water leads to the gradual removal of mercuric cyanide. Boiling water dissolves the mercuric salt more rapidly. A cold solution of potassium iodide readily dissolves the mercuric cyanide with the formation of the soluble double salt $\text{Hg}(\text{CN})_2$, 2 KI.

A series of experiments in which the mass of the reacting salts was varied, proved that a true chemical compound of the two cyanides is formed and suffers decomposition to a greater or less extent, depending on the relative amount of water present.

These results lead to the inference that the composition of the double salt is expressed by the formula $\text{Zn}_4\text{Hg}(\text{CN})_{10}$, that is to say, the two cyanides are present in it in the proportion $\text{Zn}(\text{CN})_2$, $\frac{1}{4}\text{Hg}(\text{CN})_2$. This salt contains 40.6 per cent. of mercuric cyanide. It cannot be obtained pure since it is decomposed by water and can only be produced by precipitation of aqueous solutions. Under the most favourable circumstances, when the quantity of water present is reduced to a minimum, a substance containing 98 per cent. of this double cyanide is obtained, the remaining 2 per cent. consists of zinc cyanide, resulting from the decomposition of some of the double salt by water, the mercuric cyanide being dissolved whilst the insoluble zinc cyanide remains with the double salt.

All attempts to prepare this double cyanide by other methods than that of precipitation have failed.

This tetra-zincic mono-mercuric deca-cyanide, mixed with more or less zinc cyanide, has been found by Sir Joseph Lister to be an admirable antiseptic. A full account of the best method of preparing the salt is given in the author's previous paper (see *Year-Book of Pharmacy*, 1890, 28.)

Basic Bismuth Salicylate. H. Causse. (*Comptes Rendus*, cxiii. 547.) Not long ago the author showed that ammonium chloride may be usefully employed for retarding or entirely preventing the dissociating action of water on bismuth salts, and that by its aid a neutral salicylate of bismuth can be easily prepared (see *Year-Book of Pharmacy*, 1891, 26). He now reports that sodium chloride produces the same effect on the ammonium salt. A basic salicylate of bismuth of definite composition can be prepared by dissolving 35 grams of bismuth oxide in 40 c.c. of strong hydrochloric acid, adding 500 c.c. of saturated solution of sodium chloride, then neutralizing with bismuth carbonate or oxide, and adding another 500 c.c. of strong solution of sodium chloride containing also 9 grams of sodium hydrate and 22 grams of sodium salicylate. The crystalline precipitate thus formed has a composition corresponding to the formula $(\text{Bi O}) \text{C}_7\text{H}_5\text{O}_3 \cdot \text{H}_2\text{O}$. The product is separated from the liquid by decantation and washed with water very slightly acidulated with dilute nitric acid.

Synthesis of Tartaric Acid. P. Genvresse. (*Comptes Rendus*, cxiv. 555-557; *Journ. Chem. Soc.*, July, 1892.) Glyoxylic acid is treated with zinc powder in presence of acetic acid diluted with its own weight of water, first at the ordinary temperature, and afterwards on the water-bath. The zinc is added gradually to the mixture of the two acids, the proportions of the molecules being, glyoxylic acid, 1; acetic acid, 3; zinc, 2. Under these conditions glyoxylic acid is converted into tartaric (racemic) acid, the reaction being analogous to the conversion of acetone into pinacone, or benzaldehyde into hydrobenzoin. The racemic acid is identified by the behaviour of the calcium salt, the reduction of ammoniacal silver nitrate, and the isolation of the free acid and measurement and analysis of the crystals.

Compound of Sodium Bisulphide and Alcohol. L. Demont. (*Journ. de Pharm.*, xxiii. 554-547; *Journ. Chem. Soc.*, October, 1891, 1170.) If a mixture of anhydrous mono- and polysulphides of sodium is placed in absolute alcohol, the liquid gradually assumes a yellow colour, and a slight, although clearly

perceptible, rise in temperature may be noted. The mixture is heated gradually to boiling, allowed to cool, and filtered from the excess of sulphide. On adding perfectly dry ether, an abundant, slightly crystalline precipitate is produced. If the ether is not perfectly dry, beautiful crystalline needles first appear, followed by the less crystalline deposit above. The precipitate first formed with moist ether appears to take water of crystallization, and when the ether has thus been rendered dry, the granular precipitate follows. The precipitate is very hygroscopic. When rapidly drained, placed over sulphuric acid, or heated at 100° , it loses about 40 per cent. of its weight. The compound thus obtained was analysed, and corresponds with the formula $C_2H_6O + 9NaS$. The original precipitate would be sensibly $C_2H_6O.NaS$.

Action of Sulphuric Acid on Chloroform. C. Schacht and E. Biltz. (*Pharm. Journ.*, 3rd series, xxii. 1041.) As the result of a great number of observations respecting the action of concentrated sulphuric acid on different kinds of chloroform, the authors arrive at the following conclusions:—

1. That chloroform prepared from alcohol and chloride of lime, when perfectly purified by concentrated sulphuric acid and completely freed from alcohol by copious washing with water, does not communicate any colour to concentrated sulphuric acid either before or after its decomposition by air and light.

2. When chloroform which does not colour sulphuric acid imparts, after undergoing decomposition, a colour to sulphuric acid, that result can only be due to the action of a product of the decomposition—especially free chlorine—upon some foreign substance, *i.e.*, either ethyl chloride or alcohol. If therefore, in decomposing chloroform free from alcohol and in contact with a layer of sulphuric acid, a drop of alcohol be added, the free chlorine and the phosgene gas disappear immediately, and the sulphuric acid is coloured brown owing to the alcohol having been converted into ethyl chloride.

3. When chloroform which is absolutely free from alcohol and does not colour sulphuric acid is left to undergo decomposition, and the acid after that becomes brown, this coloration indicates the presence of ethyl chloride which has been converted by the free chlorine into a higher chlorinated product.

Applying these results to Pictet's chloroform, the authors come to the conclusion that it is in regard to purity one of the best, if not the best, to be met with. But it is as prone to decomposition as ordinary chloroform, and the precautions of adding alcohol and

protecting against light are as indispensable in the one case as in the other.

Impurity in Chloroform. D. Brown. (*Pharm. Journ.*, 3rd series, xxii. 769.) The author states that at present no process is known by which the total impurity in chloroform can be determined. But by careful fractional distillation, and dividing the sample under examination into two fractions, one of 10 per cent., the other of 75 per cent., and a residue of 15 per cent., both the more and less volatile impurities are obtained in a concentrated form, and thus betray themselves by their odour. The non-volatile impurity may be determined by slow evaporation, with precautions to exclude dust, at a temperature of about 90° F. This process, which may be considered as an extension of the present test of the B.P., requires about 130 c.c. of the sample, and several days' time for each experiment. In order to show the necessity for a more exacting test than that of the Pharmacopœia, the author gives the following tabulated results of his examination of seven samples of commercial chloroform, every one of which was found to answer all the B.P. tests:—

No.	10 p.c. fraction.	15 p.c. residue.	Residue at 80°-90° F. Parts by weight.
1.	No bad smell	No bad smell	1 part in 1,946,100
2.	" "	" "	1 " 487,500
3.	" "	" "	1 " 487,500
4.	" "	" "	1 " 487,500
5.	" "	" "	1 " 390,000
6.	" "	" "	1 " 121,875
7.	" "	" "	1 " 243,750

Six other samples, some said to be of B.P. purity, and others laying claim to chemical purity, were subjected to the same treatment, and gave the following results:—

No.	10 p.c. fraction.	15 p.c. residue.	Residue at 90°-90° F. Parts by weight.
1.	Bad smell	Very bad smell	1 part in 57,352
2.	" "	No " "	1 " 324,999
3.	Very bad smell	Very " "	1 " 243,750
4.	Slight "	Bad smell	1 " 121,875
5.	" "	" "	1 " 324,999
6.	" "	" "	1 " 390,000

The author does not think the boiling point to be of much value for detecting impurity in commercial chloroform.

Impurities of Chloroform. M. C. Traub. (*Schw. Wochenschr. für Chem. u. Pharm.*, 1892, 11; *Amer. Journ. Pharm.*, March, 1892.) In the fractional distillation of a large quantity of chloroform (made by the bleaching-powder process) it was possible to separate a small fraction boiling between 57° and 59° C., and having a specific gravity of 1.185; this is believed to consist of ethylidene-chloride along with some chloroform. Other impurities of the chloroform give rise to a blue or violet colouring matter upon agitation with sulphuric acid; also a principle developing a peppermint-like odour. It is possible by prolonged treatment with sulphuric acid to remove all of these impurities and obtain a chloroform which is in no way inferior to the chloroform of Pictet. An important matter is to decide between such pure chloroform and others of less purity; the results so far obtained warrant the following stringent sulphuric acid test:—Equal volumes of chloroform and sulphuric acid (protected from light), agitated frequently during six to eight days, should show no change in colour; after the chloroform has evaporated spontaneously from the separated sulphuric acid layer, the acid diluted with five parts of water should not show any change upon the addition of 1 c.c. $\frac{1}{10}$ silver nitrate solution. The requirements of this test, it is needless to state, will only be complied with by very pure samples of chloroform. Another test which promises to be useful is as follows:—0.2 gram of metallic sodium and 5 c.c. of chloroform placed in a glass-stoppered cylinder, and warmed and agitated frequently during two or three days, will give the following results:—With a pure alcohol-free chloroform there is no change to be noted, excepting that sodium chloride separates out in small crystals. The presence of alcohol or other impurities causes a more energetic reaction, and the salt separates with a yellow or brown colour. A number of samples of chloroform which answered the requirements of the German Pharmacopœia yielded besides the coloured separation of the salt, an odour of carbylamine indicating contamination with some nitrogenous substance (to which may be ascribed the formation of the blue colouring matter upon treatment with sulphuric acid).

Action of Borax on Chloral. M. Dujardin. (*Bullet. Commenc.*, April, 1891.) No action takes place between these two chemicals in the cold or at an ordinary temperature, but on warming the chloral is decomposed in the same manner as by an alkaline hydrate or carbonate. In dispensing mixtures containing these

two substances it is recommended to dissolve the borax, if necessary, by heat, and allow the solution to cool before adding the chloral.

The Solubility of Chloralamide. G. Lunan. (*Pharm. Journ.*, 3rd series, xxii. 805.) The author, finding the solubility of chloralamide variously stated by different authorities, has investigated the matter, and as the result of experiments places it at 1 in 20.5 of distilled water at 15.5° C.

Chloralimide. R. Schiff. (*Gazzetta Chim. Ital.*, xxi. 490-497.) The author has re-investigated the action of ammonium acetate on chloral hydrate, and finds that the product of very indefinite melting-point which Pinner and Fuchs supposed to be chloralimide, $\text{C Cl}_3\text{CH:NH}$, is a mixture. On fractional crystallization from alcohol, it is separated into three distinct compounds melting at 146°, 97°, and 225° respectively. A description of these three bodies will be found in the original paper.

Refractive Power of Levulose and Invert-Sugar. H. Ost. (*Ber. der deutsch. chem. Ges.*, xxiv. 1636-1645. From *Journ. Chem. Soc.*) The differences in the refractive power of levulose observed by various chemists have led the author to carry out fresh determinations. The sugar employed was prepared from inulin, and was crystallized from absolute alcohol three or four times; the product is anhydrous, is not hygroscopic, and decomposes slowly at 100°. Heating is without effect on the refractive power of neutral aqueous or alcoholic levulose solutions.

For solutions containing 3 to 30 per cent. by weight of levulose the refractive power is given by the formula $(a) 20/D = -(91.90 + 0.111 p)$, where p is the percentage of sugar in grams. These results are higher than those of Hönig and Jesser for solutions containing less than 25 per cent. of the sugar; for concentrations above this, the results are somewhat lower. The values of Jungfleisch and Grimbart are about 3 per cent. lower throughout, apparently pointing to the presence of some inactive impurity in their preparations.

A comparison was instituted between the actual refractive powers of various solutions of equal parts of levulose and dextrose, and the theoretical values calculated from the author's numbers for levulose and those of Tollens for dextrose; the agreement is very close, and the numbers would be almost identical if Tollens' figures should prove to be slightly too high, in consequence of some decomposition of the dextrose having taken place while being dried at 60°-70°.

Comparative experiments were instituted to show the amount of monosaccharoses decomposed during the inversion of sucrose by means of hydrochloric acid, acetic acid, and oxalic acid of various concentrations and at different temperatures. Acetic acid decomposes levulose at ordinary temperatures, as does also 0.1 per cent. hydrochloric acid at 100°; the best results are obtained by heating the sugar at 60° for 1.5 hours with a 2 per cent. solution of oxalic acid, or for 4 hours with a 1 per cent. solution; the presence of the oxalic acid is without effect on the refractive power of invert-sugar.

The results of Grubbe are thus confirmed, whilst those of Jungfleisch and Grimbert are shown to be incorrect.

A Saccharine Product from Quince-juice. R. W. Bauer. (*Landw. Versuchs-Stat.*, 469-470.) On boiling quince-juice with very dilute sulphuric acid, a sugar is formed having approximately the same rotatory power as dextrose and yielding a yellow osazone fusing at 204°.

Saccharine Constituents of the Fruit of the Cherry Laurel. C. Vincent and M. Delachanal. (*Comptes Rendus*, cxiv. 486-487.) The authors have obtained two sugars from the ripe fruit of the cherry laurel, and have identified them as "mannitol" and "sorbitol" respectively. The latter was found to be identical in all respects with sorbitol from mountain ash berries.

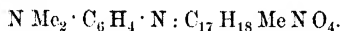
Eulyte. A. Angeli. (*Ber. der deutsch. chem. Ges.*, xxiv. 1303-1305.) Eulyte, $C_6H_6N_4O_7$, is obtained by the action of nitric acid on citraconic acid. By the action of alkalis nitrous acid is eliminated, and on the addition of iodine to the solution, a precipitate of iodoform is produced. Mineral acids effect no decomposition except at an elevated temperature under pressure.

Note on Narceine. D. B. Dott. (*Pharm. Journ.*, 3rd series, xxii. 747.) Conflicting statements have been published with reference to the solvent action of chloroform on this base. The author has therefore re-investigated this subject, and finds that narceine is practically insoluble in pure chloroform.

Pseudocodeine. E. Merck. (*Archiv der Pharm.*, ccxxix. 161-164.) This base was obtained during the preparation of apocodeine, and found to have a composition corresponding to the formula $C_{18}H_{21}NO_5 + H_2O$. It crystallizes in transparent needles which fuse at about 179°C., and are soluble in alcohol and sparingly soluble in ether. From the alcoholic solution it is precipitated on the addition of water. Its physiological action is similar to, but somewhat weaker than, codeine.

Note on Codeine Sulphate. J. W. England. (*Amer. Journ. Pharm.*, March, 1892.) The author has met with commercial samples of this salt which, when treated with water, left an insoluble residue, amounting in one instance to as much as 7·7 per cent. This residue proved to be free codeine.

A Violet Colouring Matter derived from Codeine. P. Caze-neuve. (*Comptes Rendus*, cxiii. 747-749.) A short time ago the author described a violet colouring matter derived from morphine (see abstract, *Year-Book of Pharmacy*, 1891, 70). By an analogous process is now obtained a similar product from codeine, to which he assigns the formula



This violet dyes silk, wool, and gun-cotton without a mordant, but the colour is liable to fade on exposure to light. When an aqueous solution of this body is poured upon strong sulphuric acid, it gives, like the safranines, a green zone, changing to blue, and then to violet, thus indicating the presence of poly-acid combinations. A similar reaction also takes place with the corresponding colouring matter derived from morphine.

A Reaction of Morphine. G. Vulpinus. (*Comptes Rendus*, September 14th, 1891.) On mixing two or three drops of a solution of morphine with 6 drops of strong sulphuric acid in a small dish, then adding a small quantity of sodium phosphate and heating the dish over a flame while stirring the mixture, a violet coloration is produced. If now, after cooling, cold water be added drop by drop, the colour changes to bright red, and ultimately to a dirty green.

Cryptopine. D. R. Brown and W. H. Perkin. (*Proc. Chem. Soc.*, 1891-92, No. 103.) The author has commenced an investigation on the rare alkaloid cryptopine, which occurs in small quantity in opium, and which was first isolated by J. and H. Smith, and subsequently analysed by Hesse. Their analyses of the base and its oxalate confirm Hesse's results, and show that cryptopine has the formula $\text{C}_{21} \text{H}_{23} \text{N O}_5$.

On oxidation with potassium permanganate, cryptopine yields among other products a crystalline acid, $\text{C}_{10} \text{H}_{10} \text{O}_6$, m.p. 179-180°, which proves to be metahemipinic acid [1:2:4:5], the acid which Goldschmidt obtained from papaverine; this result is interesting in view of the fact that metahemipinic acid, up to the present time, has only been obtained from papaverine.

The identity of the acid obtained from cryptopine with that

from papaverine was proved by the fact that both yield an anhydride, $C_{10}H_8O_6$, m.p. 175° , and an ethylimide, $C_{12}H_{13}NO_4$, melting at 226° .

Cryptopine contains only two methoxy-groups, as shown by its behaviour when treated with hydrogen iodide, these two groups being situated in that part of the molecule which is converted into metahemipinic acid on oxidation.

Hydrastine and Narcotine. E. Schmidt. (*Pharm. Journ.*, 3rd series, xxii. 267.) The oxidation by means of potassium permanganate in alkaline solution of the compound $C_{20}H_{18}O_7$, resulting from the decomposition of hydrastine methyl iodide, is shown to yield, in addition to hemipinic acid and other bye-products, a lactone corresponding in its properties and constitution to the lactone obtained by W. Roser from narcotine or cotarnine. This observation is considered to establish the constitution of hydrastine and its relation to that of narcotine, and to confirm the opinion previously expressed, that narcotine may be represented as methoxylhydrastine.

Canadine. E. Schmidt. (*Pharm. Journ.*, 3rd series, xxii. 267.) The occurrence of a third alkaloid in *Hydrastis canadensis*, which F. Wilhelm described under the name "canadine," has been called in question by Power, but is now confirmed by the author of the present paper. He describes the base as occurring in fine, white, shining crystals, melting at $134^\circ C.$, and represents it by the formula $C_{21}H_{21}NO_4$. The salts, with the exception of the sulphate, are said to be soluble with difficulty in water and alcohol. As the alkaloid is converted by the action of iodine in alcoholic solution into hydriodide of methylberberine, it is considered that its constitution is that of dihydromethyleneberberine.

Reactions of Hydrastine and other Alkaloids. D. Vitali. (*L'Orosi*, xiv. 405-416. From *Journ. Chem. Soc.*) If a small crystal of hydrastine, or of one of its salts, is placed on a porcelain capsule and covered with concentrated sulphuric acid (0.5-1 c.c.), it turns yellow, and, on stirring, the liquid acquires the same colour; on adding a small fragment of nitre (an excess must be avoided), the colour changes to a more or less intense brownish-yellow; if a solution of stannous chloride is now added drop by drop, the solution acquires a magnificent reddish-violet colour, the intensity of which depends on the amount of alkaloid present. This coloration is not destroyed on dilution with water.

If a particle of hydrastine is treated with nitric acid (4 to 6 drops), the alkaloid turns yellow; on heating for an instant to

the boiling point, nitrous fumes are evolved, and, on evaporating to dryness at a gentle heat, a yellowish residue is left, which, when cold, is coloured brownish-yellow by alcoholic potash, and remains as a greenish-brown mass on evaporating the alcohol. When cold, this becomes deep violet on treatment with sulphuric acid. Solutions of hydrastine must be evaporated to dryness before applying the tests, which are sufficiently delicate to detect 0.0001 gram of the alkaloid.

Bebeerine turns blood-red on treatment as described with concentrated sulphuric acid and nitre, the colour changing to green on the addition of stannous chloride.

Codcine turns dark brick-red when alcoholic potash is added to its solution after treatment with nitric acid, and coffee-coloured when further treated with sulphuric acid; similarly *narcotine* acquires an orange colour on the addition of potash, the colour changing to violet-red on adding sulphuric acid, and red to yellow on diluting with water.

A rather less delicate test for hydrastine is as follows:—A particle of the solid alkaloid is fused with five or six times its weight of caustic potash, the molten mass allowed to cool, acidified with hydrochloric acid, extracted with chloroform, the extract evaporated to dryness on the water-bath, and the residue treated with a very dilute solution of ferric chloride; a fine, blue coloration is obtained if a few milligrams of the alkaloid have been employed; the colour is destroyed by acids, and changed to brownish-red by alkalis.

Clear indications of the presence of hydrastine in putrid animal matter cannot be obtained if the latter is treated by the Stas-Otto method, on account of the ptomaines and other impurities contained in the extract. Hydrastine is, however, extracted from alkaline, but not from acid, solutions by light petroleum, and, by taking advantage of this fact and substituting baryta for sodium carbonate, and light petroleum for ether, in the extraction, it is possible to isolate the alkaloid in a state of sufficient purity. The author recommends the use of light petroleum in place of chloroform, ether, or amyl alcohol in the extraction of alkaloids from urine and animal remains, as they are nearly all soluble in that menstruum (the exceptions are morphine, curarine, and pilocarpine), whilst ptomaines, leucomaines, pigments, and extractive matters are insoluble.

Scopolamine and Commercial Hyoscine. E. Schmidt. (*Apoth. Zeitung*, September 26th, 1891, 522.) Not long ago the author

reported that a crystalline alkaloid obtained by Bender from the roots of *Scopolia atropoides*, and believed to be identical with Ladenburg's hyoscine, proved to be an entirely new base which had hitherto escaped observation (see *Year-Book of Pharmacy*, 1890, 56). This new alkaloid is now further described by him under the name "scopolamine." Its composition is represented by the formula $C_{17}H_{21}NO_4$, and therefore contains two more carbon atoms than apotropine and Hesse's atropamine. When boiled with baryta water, it is decomposed into tropic acid and a crystalline base of the formula $C_8H_{13}NO_2$, melting at $110^\circ C$. The author confirms his previous observation that scopolamine also occurs in small quantities in belladonna root and stramonium seeds, and occasionally also in *Duboisia myoporoides*. He also confirms the presence of this base in commercial hyoscine salts, and states that the hyoscine hydrobromide, as now met with in commerce, consists almost entirely of the hydrobromide of this new alkaloid.

Scopolamine. E. Schmidt. (*Archiv der Pharm.*, May, 1892; *Pharm. Journ.*, 3rd series, xxii. 1006.) The author has continued his investigation of the base associated with hyoscyamine in the root of *Scopolia atropoides*. Further evidence is now brought forward in support of the view that the base which has hitherto been termed hyoscine is not an isomer of atropine and hyoscyamine, but that its composition is represented by the formula $C_{17}H_{21}NO_4$. As this base was first identified in the root of *Scopolia atropoides*, the author now proposes to name it scopolamine in order to avoid any confusion with other bases which have already been designated hyoscine.

The Mydriatic Bases of the Solanaceæ. W. Schütte. (*Archiv der Pharm.*, October 30th, 1891, 492.) See also *Year-Book of Pharmacy*, 1891, 34. The author has continued his investigation of the more important plants of this order, with the object of ascertaining which of the mydriatic alkaloids actually occur or pre-exist in them. His results are briefly summed up in the following:—Young fresh belladonna roots from uncultivated plants contained only hyoscyamine, while roots which had been kept for several years, and likewise the roots of older plants both cultivated and uncultivated, contained hyoscyamine with a small proportion of atropine. Belladonna leaves also contained hyoscyamine and a small quantity of atropine. The unripe berries of wild belladonna plants contained chiefly hyoscyamine and very little atropine, but the ripe berries contained atropine only. In the case of cultivated plants, however, the ripe berries yielded both

hyoscyamine and atropine. The ripe berries of *Atropa Belladonna lutea* were found to contain atropine with another alkaloid probably identical with atropamine. Fresh and old stramonium seeds contained chiefly hyoscyamine, with small quantities of atropine and scopolamine. The leaves of *Solanum tuberosum* yielded, in addition to betaine, traces of a mydriatic alkaloid occurring also in *Lycium barbarum* and *Solanum nigrum*; but the nature of this base has not yet been determined. The leaves of *Nicotiana Tabacum* likewise yielded traces of mydriatic alkaloids. In the seeds, herb, and root of *Anisodus luridus*, hyoscyamine only could be detected.

Belladonna Alkaloids. Identity of Atropamine and Apotropine. E. Merck. (*Zeitschr. für analyt. Chem.*, vol. xxxi., part 2.) The author shows that Hesse's atropamine is identical with apotropine.

An alkaloid obtained by Ladenburg and Roth from crude belladonnine, and melting at 242°C ., is shown to be *pseudotropine*.

The Existence of Hyoscyamine in Lettuce. T. S. Dymond. (From *Proc. Chem. Soc.*, 1891-93, No. 103.) Lettuce has been used in medicine from early times as a sedative, but the active constituent has never been with certainty determined. The author's attention was drawn a few months ago to the mydriatic action of an extract of lettuce used in medicine. It had been prepared from the flowering plant of common lettuce according to the directions of the *British Pharmacopœia*. An examination showed that the mydriatic action was due to an alkaloid. Commercial specimens of the extract of wild lettuce and of the variety of the edible plant known as cos lettuce, obtained from three different sources, together with a specimen of the dried flowering plant of wild lettuce, were all found to contain this alkaloid.

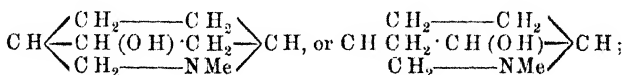
The alkaloid was most easily isolated by mixing the commercial extract with water acidified with acetic acid, adding alcohol till precipitation of nearly all the constituents of the extract occurred, filtering, evaporating the filtrate to a low bulk, filtering again, washing the filtrate with ether till free from fat, then rendering it alkaline and extracting the alkaloid with ether. The impure alkaloid thus obtained was purified by conversion into the oxalate, and the precipitate of this salt by ether from its alcoholic solution. On recovering the alkaloid and crystallizing it from chloroform, it was obtained in silky needles having approximately the same melting point and other properties as hyoscyamine, the poisonous mydriatic alkaloid existing in belladonna, henbane and other plants belonging to the natural order *Solanaceæ*.

The identity of the alkaloid with hyoscyamine was confirmed by conversion into the aurichloride which melted at 159.75° , the melting point given by Ladenburg for hyoscyamine aurichloride being 159° . The determination of the gold and the alkaloid in the compound afforded results corresponding with the formula of hyoscyamine aurichloride, $C_{17}H_{23}NO_3 \cdot HAuCl_4$.

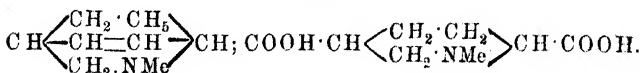
The amount of hyoscyamine in the extract of common lettuce does not exceed 0.02 per cent., while in the flowering plant itself it cannot be more than 0.001 per cent. It appears that this is the first occasion on which hyoscyamine or any other alkaloid belonging to that mydriatic group has been found in a plant not a member of the natural order *Solanaceæ*, lettuce belonging to the natural order *Compositæ*.

Tropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xxiv. 1628-1633.) In this paper crystallographic descriptions are given of the platinochloride and aurochloride of tropine. The former belongs to the monosymmetric system; the latter melts at 202° , and is deposited in pale yellow, transparent crystals of the asymmetric system. *Tropine mercurochloride*, $C_8N H_{15} O, HCl, 6 H_2 Cl_2$, is found to melt at 246° .

Tropine. G. Merling. (*Ber. der deutsch. chem. Ges.*, xxiv. 3108-3126.) The author agrees with Liebermann that Ladenburg's formula for tropine cannot be maintained, and arrives at the same conclusion with regard to the formula previously proposed by himself. He records a number of facts which can only be accounted for by adopting for tropine, tropidine, and tropic acid the following formulæ:—



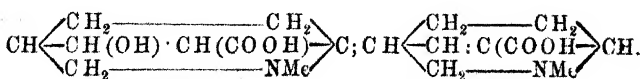
Tropine.



Tropidine.

Tropic acid.

In conformity with these formulæ for tropine and tropidine, those for ecgonine and anhydroecgonine must be represented as follows:



Ecgonine.

Anhydroecgonine.

Oxidation of Pseudotropine. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxiv. 2587.) The author finds that the principal product obtained in the oxidation of pseudotropine is tropic acid. The latter shows all the properties previously assigned to it. A small proportion of ecgoninic acid is also formed in this oxidation.

The Alkaloidal Constituents of Extract of Belladonna. L. van Itallie. (*Apoth. Zeitung*, 1892, 27.) The experiments of Schütte proving that the alkaloids present in belladonna leaves consist chiefly of hyoscyamine, made it an interesting point to determine if this alkaloid during the manufacture of the extract changed to atropine, since it has been found that the change can take place by heating to 100° C. From 10 grams of an extract, kept for about eighteen months and prepared according to the Netherland Pharmacopœia, the crude alkaloids were prepared and fractionally precipitated with auric chloride; the precipitates were recrystallized from acidulated water and dried at 100° C. The first two fractions melted at 158.5° C., the third at 156.5° C., the fourth fraction was so small that the melting point could not be determined, but under the microscope it was found to consist largely of hyoscyamine-gold-chloride, while the atropine-gold-chloride could not be identified with certainty. It follows, therefore, that the alkaloid present in the extract was almost entirely hyoscyamine, and that no change had taken place during the preparation of the extract.

The Alkaloids of True Aconitum Napellus. W. R. Dunstan and J. C. Umney. (Abstract of a paper read before the Chemical Society, March 3rd, 1892. From the Society's Proceedings.) The authors have examined the alkaloids of true *Aconitum napellus* plants grown by Mr. E. M. Holmes at the instance of the British Pharmaceutical Conference. The alkaloids were extracted from the roots by the following process, which precludes the possibility of the occurrence of hydrolysis, etc.:—The solution obtained by percolating with cold rectified fusel oil (b. p. 100–132°) was agitated with water acidified with 1 per cent. of sulphuric acid, and the resin having been removed by extracting the acid solution so obtained with chloroform, the liquid was made just alkaline with dilute ammonia and extracted with ether, which dissolved out a considerable quantity of alkaloid, but left in solution a further and smaller quantity, which was subsequently extracted by agitation with chloroform. The alkaloid soluble in ether was obtained as a gum-like mass incapable of

crystallization. By conversion into bromhydride it was separated into a crystallizable and an uncrystallizable salt.

The crystalline product was identified as the salt of aconitine, the crystalline and highly toxic alkaloid already described by one of the authors and Dr. W. H. Ince. The alkaloid separated from the pure bromhydride melted at 188.5° , and afforded on combustion numbers agreeing with the formula $C_{33}H_{45}NO_{12}$. The specific rotation of the bromhydride in aqueous solution was ascertained to be $[\alpha]_D -29.65$, a value which agrees with that previously recorded. As some doubt exists as to the solubility of aconitine in water, a determination was carefully made with this pure specimen. The mean of two determinations gave 1 gram in 4431 grams of water as the solubility at 22° ; Jürgens had previously recorded the far greater solubility of 1 in 745 at the same temperature.

The non-crystalline bromhydride furnished a gummy alkaloid soluble in ether and alcohol, but only sparingly soluble in water, the aqueous solution being alkaline to litmus, and very bitter, but not giving rise to the tingling sensation so characteristic of aconitine. Not only the alkaloid, but also the chlorhydride, sulphate, nitrate, and aurichloride prepared from it could not be crystallized. This alkaloid is not identical either with aconine or with the picroaconitine of Wright and Luff. The authors propose to assign to it the name *napelline*, which was first given to the alkaloid now known as pseudaconitine, and afterwards by Hübschmann to a substance which the work of Wright and Luff showed to be a mixture chiefly composed of aconine. The napelline obtained in the manner described is probably associated with another amorphous alkaloid about which they have at present little information to give beyond the fact that neither it nor its salts appear to crystallize.

The alkaloid soluble in chloroform was proved to be *aconine*, the compound which is obtained together with benzoic acid on hydrolysing aconitine.

The roots of true *Aconitum napellus*, therefore, must be held to contain three alkaloids, one of which is crystalline, viz., aconitine, two being amorphous, viz., napelline and aconine. Indications have been obtained of the presence of a fourth alkaloid, which is amorphous and closely resembles napelline.

The authors find that the juice expressed from the roots contains a large proportion of amorphous bases, but very little aconitine, the greater part of this latter remaining in the root,

from which it may be extracted, together with the remainder of the amorphous alkaloids, by exhausting with amyl alcohol. The total quantity of amorphous alkaloid obtained amounted to more than twice that of aconitine.

The physiological action of the alkaloids referred to is being investigated. The results so far obtained point to the conclusion that crystalline aconitine is by far the most toxic of the alkaloids contained in *Aconitum napellus*.

The Formation and Properties of Aconine and its Conversion into Aconitine. W. R. Dunstan and F. W. Passmore. (Abstract of a paper read before the Chemical Society, March 23rd, 1892. From the Society's Proceedings.) Owing to the uncertainty which exists with reference to the product of the hydrolysis of aconitine, the authors have re-investigated the subject, using a pure alkaloid. Wright and Luff have stated that when aconitine is hydrolysed the sole products are aconine and benzoic acid. More recently, however, Dragendorff and Jürgens have asserted that the hydrolysis occurs in two stages, their contention being that benzoic acid and an alkaloid identical with the picroaconitine isolated by Wright and Luff from the roots of supposed *Aconitum napellus* are formed in the first stage, while in the second stage the picroaconitine is hydrolysed into benzoic acid, methyl alcohol, and aconine, which last is the final product of hydrolysis.

The authors have carefully hydrolysed pure aconitine by heating it with water in closed tubes at 150°, but have been unable to obtain at any stage either picroaconitine or methyl alcohol. The alkaloid extracted from the solution by ether was proved to be a mixture of aconine with unaltered aconitine. Using pure aconitine, action occurs precisely in accordance with the equation, $C_{33}H_{45}NO_{12} + H_2O = C_{26}H_{41}NO_{11} + C_7H_6O_2$, leaving little doubt that aconitine is benzoylaconine.

Although attempts to establish the correctness of this inference by heating aconine with benzoic anhydride were without result, anhydro-aconitine was eventually obtained by the interaction of aconine and ethyl benzoate at 130°: as the anhydro-compound is convertible into aconitine, the partial synthesis of the alkaloid thus effected leaves no doubt that it is benzoylaconine.

Up to the present time, neither aconine nor its salts have been obtained in a crystalline state. The authors have hitherto been unsuccessful in all their attempts to crystallize aconine, but they have succeeded in crystallizing several of its salts, viz., the chloride, bromhydride, sulphate, and nitrate. All these salts are

very soluble in water, the chlorhydride being least soluble and the easiest to crystallize: it is best prepared by crystallization from a mixture of alcohol and ether; when dried at 100° it melts at 175.5° . The crystals deposited from alcohol have the composition $C_{26}H_{11}NO_{11}, HCl, 2H_2O$. When dried at 100° they still retain one molecular proportion of water, which is, however, lost at 120° . The aqueous solution is levorotatory: $[\alpha]_D = -7.71^{\circ}$. It combines with auric chloride forming an aurichloride considerably more soluble than the corresponding aconitine salt.

Aconine was prepared from the pure chlorhydride by adding silver sulphate and subsequent treatment of the aconine sulphate with exactly sufficient baryta water. The solution on evaporation furnished a hygroscopic, brittle gum which refused to crystallize: this melted at 132° , and on analysis it afforded numbers agreeing with the formula $C_{26}H_{41}NO_{11}$, which is that proposed by Dunstan and Ince from the results of their study of pure aconitine. Aconine is very soluble in water; the aqueous solution is alkaline. When dry it is insoluble in ether and almost insoluble in chloroform. It is a powerful reducing agent, precipitating the metals from solutions of gold and silver salts; it also reduces Fehling's solution. The physiological action of pure aconine is being investigated. Its aqueous solution is slightly bitter and gives rise to a burning sensation in the mouth, but does not produce the tingling which is characteristic of aconitine. In respect of its action on polarised light, aconine exhibits the same peculiarity as aconitine. Its salts are levorotatory, whilst a solution of the alkaloid is dextrorotatory, $[\alpha]_D + 2.3^{\circ}$. When heated with alkalis aconine slowly resinifies.

The examination of various agents on aconine has so far not led to any important results. Nitrous acid fails to attack it. The principal product of its oxidation by alkaline permanganate is oxalic acid. Attempts to isolate an additive compound with methyl iodide have been unsuccessful.

By the action of methyl iodide on aconitine a crystalline *aconitine methiodide* ($C_{33}H_{45}NO_{12} \cdot CH_3I$) was obtained, which melts at 219° . The *aconitine methhydroxide* prepared from the compound ($C_{33}H_{45}NO_{12} \cdot CH_3OH$) is amorphous, and the salts which it yields do not appear to crystallize. A further study will be made of this compound, and its physiological action will be investigated.

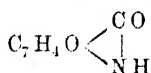
A New Alkaloid from Java Coca Leaves. F. Giesel. (*Chem. Centr.*, 1891, ii. 488.) The leaves are shown to contain, in addition

to cocaine and cinnamylcocaine, a small proportion of a new alkaloid resembling dextro-cocaine. The author has examined the hydrobromide of this base, which fuses at 49° C.

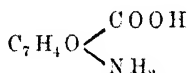
Benzoylpseudotropine, an Alkaloid of Java Coca-Leaves. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxiv. 2336-2345.) The hydrobromide of this base obtained from Dr. Giesel (see preceding abstract) was purified by extraction with ether and crystallization from boiling water. By decomposing the pure salt with sodium carbonate and extracting with ether, the pure base *benzoylpseudotropine*, $C_8H_{14}NOBz$, was obtained as an oil solidifying in crystals. It fuses at 49°, reacts strongly alkaline in alcoholic solution, is easily soluble in alcohol, ether, chloroform, benzene, and light petroleum, and is optically inactive. On heating this base with hydrochloric acid for several hours, it is completely decomposed into benzoic acid and *pseudotropine*, $C_8H_{15}NO$. After removing the benzoic acid with ether and then treating the acid solution with sodium hydrate and again extracting with ether, the last-named base is obtained in the form of needles fusing at 106-107° C., boiling at 240-241° C., and dissolving readily in water, alcohol and benzene, but not in petroleum ether. The alkaloid thus obtained is identical with Ladenburg's *pseudotropine*. The author thinks that this base can be made to yield a series of pseudotropines, corresponding to the tropines. One member of this series he has already prepared, viz., *cinamylpseudotropine*, $C_8H_{14}NO(C_9H_7O)$.

Strychnine. J. Tafel. (*Pharm. Journ.*, 3rd series, xxii. 83, from *Liebig's Annalen*, cclxiv. 33.) Some time ago Stahlschmidt prepared a crystalline base from the methyl iodide addition compound of strychnine (methyl-strychnium iodide), by successive treatment with sulphate of silver and baryta water. This he considered to be a simple methyl derivative of strychnine, although apparently it possessed entirely different physiological properties. The author has shown (*Ber. der deutsch. chem. Ges.*, xxiii. 2731) that this body is a secondary product of the action of baryta upon methyl-strychnium sulphate, produced by the inter-molecular rearrangement of the ammonium base, $C_{21}H_{22}N_2O_2CH_3(OH)$, and that it is capable of being re-converted into salts of the latter by the action of acids. Unlike strychnine, "methyl-strychnine" possesses no bitter taste, is readily soluble in water and insoluble in benzene, and moreover yields a well-characterized nitrosoamine, which proves it to be a secondary base, i.e., to contain an imido (NH) group, whilst strychnine itself is a tertiary base in which

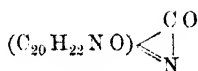
all the valencies of both nitrogen atoms are combined directly to those of carbon atoms. Further investigation of "strychnol," the compound obtained by Lœbisch and Schoop by the action of alcoholic soda upon strychnine, shows that it is formed by the addition of a molecule of water to strychnine, and may be represented by the formula $C_{21}H_{24}N_2O_3$. Its name was suggested by the phenol-like character attributed to it from its solubility in alkalies, precipitation from alkaline solution by carbonic acid, and ready oxidability; but the author's experiments indicate the presence of an imido (NH) and a carboxylic (COOH) group, and prove that strychnine is the anhydride of strychnol. The relation between strychnol and strychnine is therefore the same as that between isatic acid and isatin, so that it is proposed to re-name it strychnic acid.



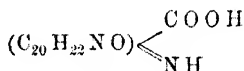
Isatin.



Isatic Acid.



Strychnine.



Strychnic Acid.

The nitrogen atom concerned in this change has been found to be the first attacked by methyl iodide, becoming pentavalent and yielding the addition product methyl-strychnium iodide, from which methyl-strychnium hydroxide may be prepared. The latter body is, as already remarked, readily convertible into methyl-strychnine by the action of alkalies, and conversely methyl-strychnium salts are formed in the presence of acids. This chemical behaviour admits of an explanation of the physiological action attributed by Stahlsehmidt to methylstrychnine, observed by Brown and Fraser for methyl-strychnium salts. As Stahlsehmidt in his biological experiments introduced methylstrychnine into the stomachs of rabbits, it is possible that sufficient acid was present to effect a conversion into a methyl-strychnium salt. This assumption is borne out by some experiments made at the author's suggestion by Dr. D. Gerhardt, who found that a subcutaneous injection of an aqueous solution of methylstrychnine produced unmistakable symptoms of strychnine poisoning.

Cytisine. J. v. d. Moer and P. C. Plugge. (*Archiv der Pharm.* [2], xxix. 48-68.) By repeated treatment of this alkaloid

with chloroform and ether the author has obtained it in a perfectly pure state. It is a strong base, forming colourless and odourless crystals, which melt at 151°C . and are readily soluble in water, alcohol, chloroform, and acetic ether, very slightly soluble in benzene and amyl alcohol, and insoluble in ether, petroleum benzin, and carbon bisulphide. An aqueous solution has a rotatory power of $[\alpha]_{\text{D}} = -120^{\circ}$. On adding a solution of a ferric salt to the free alkaloid, or one of its salts, a red coloration is produced, which on the further addition of a few drops of solution of hydrogen peroxide disappears, and gives rise to a blue colour on warming. This reaction is stated to be very characteristic and delicate, being capable of indicating 0.00005 gram. This test is also very useful for the detection of cytisine in poisoning cases, after the alkaloid has been separated from the vomits, urine, etc., by Dragendorff's method, advantage being taken of its solubility in chloroform.

Partheil's statement as to the identity of cytisine and ulexine (abstract, *Year-Book of Pharmacy*, 1891, 42) is confirmed.

Sophorine and Cytisine. P. C. Plugge. (*Archiv der Pharm.*, cexxix. 561.) The results of the author's experiments on sophorine, the alkaloid from the seeds of *Sophora tomentosa*, point to the identity of this base with cytisine, the alkaloid of laburnum.

Hydrocotoin and Protocotoin. G. Ciamician and P. Silber. (*Pharm. Post.*, xxv. 4. From *Pharm. Journ.*) See also *Year-Book of Pharmacy*, 1891, 55. The authors find that commercial hydrocotoin, from paracoto bark, contains another substance, to which they give the name of protocotoin, $\text{C}_{16}\text{H}_{14}\text{O}_6$. Being less soluble in alcohol, it may be separated from hydrocotoin by repeated recrystallization. The constitution and relations of these bodies are probably represented by the structural formulæ—



Protocotoin forms pale yellow prisms and melts at 142°C . It appears to be of a ketone nature.

The Crystallizable Alkaloid of Ephedra Monostachya. P. Spehr. (*Pharm. Zeitschr. für Russland*, 1892, No. 1-7.) The author calls attention to the distinctive characters of the crystalline alkaloid *ephedrine* isolated by him from *Ephedra monostachya* (see *Year-*

Book of Pharmacy, 1891, 167), as compared with ephedrine and pseudoephedrine from *Ephedra vulgaris*. To avoid confusion between these three bodies, their characters are given side by side in the following table :—

	Naga's Ephedrine.	Pseudo- ephedrine.	Spehr's Ephedrine.
Formula	$C_{10}H_{15}NO$	$C_{10}H_{15}NO$	$C_{13}H_{19}NO$
Melting { of the base	210°	115°	112°
point { „ hydrochloride	216°	174°	207°
Solubility {	water	1 : 454	very soluble
	alcohol	very soluble	„
	absolute ether	1 : 15	1 : 98
	benzene	1 : 26	1 : 1180
in {	chloroform	1 : 8	1 : 11
	„ „ „ „	„	„
Taste	bitter	bitter	burning
Physiological action	very poisonous and mydriatic	very poisonous and mydriatic	very feeble
Crystalline { of the base	rhombic	rhombic	monocline
	form { „ hydrochloride	„	hexagonal

The Alkaloids of Areca Nut. E. Jahns. (*Ber. der deutsch. chem. Ges.*, xxiv. 2615-2617; also *Archiv der Pharm.*, ccxxix. 669-707.) The author has continued his researches on the areca bases, and has succeeded in discovering an additional alkaloid in this drug, which he describes under the name *guvacine*. Its composition is represented by the formula $C_6H_9NO_2$. It crystallizes in small, lustrous scales, is easily soluble in water and dilute alcohol, and insoluble in strong alcohol, ether, chloroform, and benzol; at 265° C. it becomes dark in colour, and melts at 271-272° with decomposition. It forms salts of acid reaction showing the same solubilities as the base.

Further investigation of the previously known areca bases has shown that both arecoline and arecaidine exist ready formed in the areca nut, and that the latter is not derived from the former in the process of extraction. Arecaidine and arecaïne are most easily separated by treatment with hydrochloric acid and methyl alcohol, since the former is thereby converted into its methyl derivative, arecoline, whilst the latter remains as hydrochloride.

Piperidine. E. Lellmann and R. Just. (*Ber. der deutsch. chem. Ges.*, xxiv. 2099-2104.) This paper deals with *paratolyl-piperidine*, *parabromophenylpiperidine*, and *orthamidophenylpiperidine*. For particulars reference should be made to the original.

Physostigmine Salicylate. P. Birkenwald. (*Pharm. Zeitschr. für Russland*, 1891, 657.) The following method of preparation is

stated to yield this salt in colourless crystals. A solution of physostigmine sulphate is treated with an excess of sodium bicarbonate, and shaken with several successive portions of ether in a separator. The united ethereal solutions are filtered into a beaker containing an ether solution of the calculated quantity of salicylic acid. The crystals of salicylate of physostigmine which are thus formed are washed with ether and dried in a dark place in vacuo. In this process the risk of any partial conversion of the alkaloid into rubescine under the influence of air and light is entirely avoided.

Corydaline. J. J. Dobbie and A. Lauder. (*Proc. Chem. Soc.*, 1892, No. 113.) The alkaloid examined by the authors is identical with that obtained by Adermann in 1890 from the roots of *Corydalis cava*, by extracting with alcohol and exhausting the alcoholic solution with benzene. The two alkaloids agree in composition, in solubility, in melting point, in their action on polarised light (dextrorotatory), and in the character of the salts which they form. On the other hand, it is quite distinct from hydroberberine, with which Adermann believed his alkaloid to be identical or, at least, isomeric.

When treated with concentrated solution of hydrogen iodide, one molecular weight of corydaline gives four molecular proportions of methyl iodide and the iodhydride of a new alkaloid which has the formula $C_{14}H_{21}NO_4.HI$. The alkaloid is obtained from this salt by the addition of ammonia or potassium hydrate, and dissolves in excess of either agent. It possesses powerful reducing properties, and dissolves in alcohol, forming a deep red-coloured solution. The conclusion that the four oxygen atoms in corydaline are united to methyl groups is confirmed by the failure to obtain any definite action with phenylhydrazine or phosphorous pentachloride.

The Alkaloids of Berberis Aquifolium and B. vulgaris. C. Rüdel. (*Archiv der Pharm.*, cxxix. 631-666; *Journ. Chem. Soc.*, May, 1892.) The publications of Wacker, of Hesse, and of Stubbe, on the alkaloids of the roots of *Berberis vulgaris*, and those of Parsons, of Jungk, and of Stubbe on the alkaloids of the roots of *Berberis aquifolium*, show that each contains three alkaloids, and that they are in all probability the same. The chemical formula and the exact description of the salts were not, however, very perfectly defined, and the author has endeavoured to complete this part of the work.

The ground-up roots were in each case extracted with very dilute acetic acid, and the extract was then concentrated to a

syrup. Oxyacanthine was precipitated by sodium sulphate, berberine as acetone-berberine (Gaze's method), and berbamine by the addition of sodium nitrate.

Oxyacanthine is found to correspond to the formula, $C_{19}H_{21}NO_3$, berbamine, to $C_{18}H_{19}NO_3$, and berberine, to $C_{20}H_{17}NO_4$. A description of the three bases will be found by reference to the original. The author is unable to confirm the existence of the "methylberberine" observed by Gaze as occurring in *hydrastis* berberine.

Chrysanthemine. F. M. Zucco. (*Gazzetta Chim. Ital.*, xxi. 516-554; *Journ. Chem. Soc.*, January, 1892, 84.) The author supplies some further information with respect to the alkaloid chrysanthemine which, a short time ago, he succeeded in isolating from the flowers of *Chrysanthemum cinerariæfolium* (abstract *Year-Book of Pharmacy*, 1891, 176). The base is prepared in quantity by boiling about 10 kilos. of the flowers in distilled water (3 parts) for 2 or 3 hours, filtering through cloth, pressing the residue, and treating it again in the same manner. The extracts are evaporated down to 30 litres, treated with neutral lead acetate and basic acetate of lead, neutralised with soda, filtered, and the excess of lead removed by passing sulphuretted hydrogen. After filtration, the liquid is concentrated to about 2 litres, boiled for some time with dilute sulphuric acid, filtered, and again boiled until no more resinous matters are formed. The liquid is then decolorised with animal black and an excess of the double iodide of potassium and bismuth added, when a heavy, bright-red, crystalline powder containing the whole of the alkaloid is deposited.

The pure alkaloid *chrysanthemine*, $C_{14}H_{28}H_2O_3$, is a colourless syrup, which, when kept in a vacuum, partially crystallizes in tufts of silky needles, and may be heated without decomposition to 100° , but not beyond that temperature. It dissolves in water forming alkaline solutions which absorb carbonic anhydride from the air; it is also soluble in ethyl and methyl alcohols, but not in ether, chloroform, or benzene. Salts of chrysanthemine yield, with the double iodide of potassium and bismuth, orange-red, flocculent precipitates which become crystalline and bright-red on agitation; with the double iodide of mercury and potassium, a yellowish-white precipitate; with the iodide of platinum and sodium, a brown precipitate; with auric trichloride, a yellow, crystalline precipitate which dissolves on heating and is re-deposited on cooling; no precipitate is formed with platinic chloride, picric acid, tannin, or mercuric chloride. The base is

optically inactive and physiologically innocuous. Its salts are for the most part soluble in water and even deliquescent.

Reaction of Glaucine. J. A. Battandier. (*Journ. de Pharm. et de Chim.*, xxv. 350-351.) The following characteristic reaction for glaucine is recommended:—4 drops of acid mercuric nitrate solution are added to and well mixed with 10 c.c. of sulphuric acid; a porcelain saucer is moistened with this mixture, and minute crystals of glaucine, or one of its salts, are added. On inclining the saucers, intense green striae are formed which gradually become red.

The author also gives details of an improved process for the preparation of pure crystallized salts of this base.

The Alkaloids of *Lupinus Albus*. A. Soldaini. (*Gazzetta Chim. Ital.*, xxii. I. 177-180.) The author describes two isomeric alkaloids, one of which is solid and crystallizable, and has a composition answering to the formula $C_{15}H_{24}N_2O$, while the other is a liquid apparently identical with the lupanine extracted from *Lupinus angustiflora* both by Hagen and Siebert.

Lupanine. C. Siebert. (*Archiv der Pharm.*, cexxix. 531-546.) This alkaloid was isolated from the blue lupine, *Lupinus angustifolius*, by Hagen, who assigned to it the formula $C_{15}H_{25}N_2O$. This the author shows to be untenable, and replaces it by $C_{15}H_{24}N_2O$. The base is freely soluble in cold water and alcohol. It is not changed by heating with fuming hydrochloric acid at 200° , or with concentrated aqueous or alcoholic sodium hydrate solution at the ordinary pressure. When heated with soda-lime, the lupanine molecule is split up, 1 atom of nitrogen appearing as ammonia, and the other as a pyridine base. By oxidation with potassium permanganate in acid solution, lupanine yields carbonic anhydride, a little ammonia, a neutral substance, $C_{13}H_{20}N_2O_3$, and a nitrogenous acid.

The alkaloid serving for this investigation was prepared in the following manner:—The crushed seeds were extracted eight times with two successive quantities of alcohol containing hydrochloric acid; the extract was distilled, the residue made alkaline with potassium hydrate, and extracted with ether; the ethereal solution was shaken with dilute hydrochloric acid, and the aqueous solution of the hydrochloride thus obtained was again treated with potassium hydrate and ether to separate the pure base. The yield was 0.33 per cent.

Action of Hydriodic Acid on Quinine. E. Lippmann and F. Fleissner. (*Monatshefte*, xii. 327.) On warming quinine with

hydriodic acid of sp. gr. 1.7-1.8, the hydriodide of a base named *hydriodoquinine* is obtained as a heavy, yellow, crystalline powder which is sparingly soluble in cold water, and crystallizes from alcohol in bright yellow prisms fusing at 215° - 230° with decomposition. When dissolved in hot water it undergoes partial decomposition. On treatment with dilute ammonia it yields the base *hydriodoquinine*, $C_{20}H_{24}N_2O_2$, HI, which crystallizes in slender needles, softening at 95° , and beginning to fuse at a higher temperature. It is insoluble in water, but soluble in alcohol and ether, and forms soluble salts with acids. The platinochloride is obtained as a light-brown precipitate, the composition of which corresponds to the formula $HI, C_{20}H_{24}N_2O_2, H_2PtCl_6 + 2H_2O$.

Isoquinine. E. Lippmann and F. Fleissner. (*Monatshefte*, xii. 337; *Journ. Chem. Soc.*, January, 1892.) This base is obtained when hydriodoquinine (preceding abstract) is boiled with alcoholic potash. After repeated crystallizations from ether and dilute alcohol, it melts at 186° (uncorr.). Hesse and Lenz have given the melting point as 174.4 - 175° and 170.4 - 174.4° respectively. The base is laevorotatory, $[\alpha]_D = 186.75^{\circ}$ being the rotation of an alcoholic solution containing 0.9644 gram in 100 c.c., and $[\alpha]_D = -180.8^{\circ}$ for a solution containing 3.9936 grams in 100 c.c. Isoquinine crystallizes in small needles containing 2 mols. of H_2O ; the *sulphate*, $[C_{20}H_{24}N_2O_2]_2, H_2SO_4 + 10H_2O$, forms characteristic groups of slender needles readily soluble in water, giving a ready means of distinguishing between the base and quinine. The *normal hydrochloride*, $C_{20}H_{24}N_2O_2, HCl + 2H_2O$, crystallizes in needles, and is readily soluble in water; the *acid hydrochloride*, $C_{20}H_{24}N_2O_2, 2HCl$, is not so easily soluble; the platinochloride may be obtained as a crystalline, yellow precipitate; and the compound with silver nitrate, $C_{20}H_{24}N_2O_2, AgNO_3$, is precipitated as a gelatinous mass on adding an alcoholic solution of the base to a solution of silver nitrate.

Isocinchonines. E. Jungfleisch and E. Léger. (*Comptes Rendus*, cxii. 942-945, and cxiii. 651-654.) The authors consider the isocinchonine obtained by Hesse's method to be a mixture of cinchonigine, cinchoniline, and a non-crystallizable base. The isocinchonine of Comstock and Koenig is regarded by them as identical with cinchoniline. The main portion of these papers is controversial.

A polemical paper on the same subject by O. Hesse is published in *Liebig's Annalen*, cclxvi. 245-248.

Light Quinine Sulphate. P. Carles. (*Bull. Soc. Chim.*, iv. 108. From *Pharm. Journ.*) The author reports that when a few crystals of ammonium sulphate are added to a hot saturated solution of quinine sulphate and allowed to dissolve slowly, the quinine salt crystallizes in a very voluminous form. In operating upon the large scale, the ammonium sulphate crystals may be added to a portion of the solution to be crystallized, and when that becomes a thick paste by crystallization, it may be mixed with the larger quantity and stirred until the whole crystallizes. About four grams of the salt to one litre of solution gives the best result. The presence of the ammonium salt appears to act by reducing the solubility of the quinine sulphate, and as a further advantage much less remains dissolved in the mother liquor.

Quinine Hydrochlorates. O. Hesse. (*Liebig's Annalen*, cclxvii. 142-144.) Quinine hydrochlorate crystallizes both in needles and in octahedra, the former containing 2, and the latter $1\frac{1}{2}$ molecules of water of crystallization. The needles part with their water at 120°C . and fuse at 159°C . On adding to the solution the requisite proportion of hydrochloric acid, the acid salt, $\text{C}_{20}\text{H}_{21}\text{N}_2\text{O}_2 \cdot 2\text{HCl}$, is formed, and is obtained on slow evaporation in the anhydrous condition, partly in the form of needles and partly as a gelatinous mass.

Quinine Tannate. J. E. De Vrij. (*Oesterr. Zeitschr. für Pharm.*, 1892, 67.) The author recommends the following method of preparation:—1 part of pure quinine is very intimately mixed with 4 parts of pure tannin, the mixture treated with 10 parts of water, and the whole evaporated on a water-bath at a temperature not exceeding 60°C . The residue is then powdered and further dried at the same temperature. The product contains 20 per cent. of quinine.

Valerianate of Quinine and Antipyrine. M. E. Sochaczewski. (*Amer. Journ. Pharm.*, August, 1891, from *Bull. Comm.*) The author gives the following as the best method of preparing this compound:—Dissolve 10 grams of valerianate of quinine in a sufficient quantity of 90 per cent. alcohol to give a thoroughly saturated solution. Dissolve 10 grams of antipyrine in the smallest possible quantity of distilled water. Mix the solutions in a crystallizing dish and carefully apply heat, not exceeding 122°F . The salt is thus obtained in fine crystals.

Benzoate and Picrate of Antipyrine. S. Cressati. (*Pharm. Post.*, 1892, 93; *Amer. Journ. Pharm.*, March, 1892.) Antipyrine benzoate is prepared by adding antipyrine to a boiling solution of

benzoic acid; it melts below the boiling point of water, forming a yellow liquid which solidifies to an opaque, crystalline mass; from alcoholic solution it is obtainable in small crystals. It is almost insoluble in hot or cold water, but is quite soluble in alcohol and ether; it has a faint odour of benzoic acid and possesses a pungent taste. *Antipyrine picrate* can be obtained in the same manner; it forms a pale yellow powder having the same solubilities, but is not so fusible. Both give a red coloration with ferric chloride.

Nitrogenous Bases Present in Cotton-Seed. W. Maxwell. (*Amer. Chem. Journ.*, 1891, 469.) A preparation from cotton-seed is used in Germany as a diet for young cattle, but has been proved in some cases to have poisonous properties. These properties having been attributed to the presence of the poisonous bases choline and betaine, the author has undertaken a chemical examination of the cattle-foods obtained from cotton-seed, and finds both bases present, in the proportion, in the sample examined, of 17.5 per cent. of choline and 82.5 per cent. of betaine. Prof. Gaebtgens states that a dose of 0.3 gram of choline given to a strong cat causes immediate paralysis, and a dose of 0.5 gram immediate death. Toxic properties have not yet been observed with certainty in the case of betaine.

Commercial Digitalins. J. Fouquet. (*Bull. gén. de Thérap.*, 1892, 71; *Amer. Journ. Pharm.*, June, 1892.) In speaking of the therapeutic value of digitalin, the author states that of the more or less active principles of digitalis the following are soluble in chloroform, but insoluble in water: crystalline digitalin, amorphous digitalin, and digitoxin. Digitaletin and German digitalin are soluble in water and insoluble in chloroform. Of these principles those of the first group are the most active, and the crystallized digitalin deserves the preference. It should be given in the full dose of 1 milligram, and if this be followed by sufficient diuresis, another dose of $\frac{1}{2}$ milligram may be given the next day.

Digitaletin. J. Houdas. (*Comptes Rendus*, cxiii. 648-651.) Schmiedeberg's soluble digitalin, which was stated by him to consist of two distinct bodies, digitonin and digitaletin, is found by the author to contain but one glucoside, to which he gives Nativelle's name *digitaletin*. Repeating Schmiedeberg's experiments, he attempted to effect the separation into the two bodies just named by treatment with absolute alcohol and precipitation with ether, but found that the crystals obtained from the solution were identical with the portion remaining undissolved. Digitaletin is characterized by the following properties:—It is slowly soluble

in cold water, and rapidly so in hot water; this solution does not yield a crystalline product. At 250°C . it cakes together, at 270°C . it begins to decompose, and at 280°C . caramelization is complete. The aqueous solution is precipitated by tannin and ammoniacal lead acetate. On adding to the aqueous solution of digitalein an alcohol of the fatty series, a crystalline compound, consisting of the alcohol and hydrated digitalein, is formed, the solubility of which is inversely proportional to the molecular weight of the alcohol used. This constitutes the most characteristic property of digitalein. The body obtained under these circumstances with ethylic alcohol loses its alcohol and water at 110°C .

Digitalein has a composition corresponding to the formula $\text{C}_{63}\text{H}_{52}\text{O}_{34}$. Upon suitable treatment with dilute acids it yields two crystallizable glucosides without the formation of glucose.

Digitonin. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xxiv. 3951-3954.) The author denies the correctness of Houdas' statement that the digitalein described by the latter (preceding abstract) consists almost entirely of one single substance, namely, that described by Schmiedeberg and Kiliani as digitonin. In contradiction to this statement he asserts that digitalein is really a mixture of seven or eight substances, and contains at most 60 per cent. of digitonin. He also criticises the statement that the addition of a fatty alcohol to a solution of digitalein, causes the precipitation of a crystalline compound containing alcohol of crystallization. He finds this to be incorrect so far as ethyl alcohol is concerned. Digitonin, after crystallization from 85 per cent. alcohol, contains 5 mols. of H_2O , which are evolved at 110° , leaving a substance of the composition $\text{C}_{27}\text{H}_{46}\text{O}_{14}$; it does not lose more water without undergoing simultaneous decomposition, whence it appears that the formula of digitonin is $\text{C}_{27}\text{H}_{46}\text{O}_{14}$, and not $\text{C}_{27}\text{H}_{44}\text{O}_{13} + \text{H}_2\text{O}$, as previously stated.

Saponin. O. Hesse. (*Liebig's Annalen*, cclxi. 371-378.) The author arrives at the conclusion that saponin and senegin are identical, and that the supposed varieties of saponin obtained from various *Caryophyllaceae* are all one and the same compound. He assigns to saponin the formula $\text{C}_{32}\text{H}_{32}\text{O}_{17}$, which readily explains its conversion, under the influence of hydrolyzing agents, into 3 molecules of glucose and a compound of the formula $\text{C}_{14}\text{H}_{22}\text{O}_2$, as determined by Rochleder. For the last-named body the author proposes the name *sapogenol*. The adoption of the formula $\text{C}_{32}\text{H}_{32}\text{O}_{17}$ renders it easy to express the formation of sapogenin, saponetin, and saporetin (senegenin) by simple equations.

Sapotin. G. Michaud. (*Amer. Chem. Journ.*, xiii. 572.) Sapotin is a glucoside of the formula $C_{29}H_{52}O_{20}$, occurring in the kernels of the seeds of *Achras sapota*, from which it can be extracted by means of strong alcohol. It forms a white crystalline powder having an acrid burning taste, and fusing with decomposition at $240^{\circ}C$. It is readily soluble in water and boiling alcohol, sparingly soluble in cold alcohol, and insoluble in ether, chloroform, and benzene. Its rotatory power is $[\alpha]_D = -32.11$. Upon hydrolysis with dilute acids it yields glucose and *sapotiretin*, $C_{17}H_{32}O_{10}$, an amorphous substance, which is very soluble in alcohol, soluble in chloroform, but insoluble in water and ether.

Aristolochin. J. Pohl. (*Arch. für exper. Pathol. u. Pharm.; Apoth. Zeitung*, 1891, 642. From *Amer. Journ. Pharm.*) Aristolochin is the name given by the author to the active principle of the seeds of *Aristolochia Clematidis* and the roots of *A. rotunda* and *A. longa*. The powdered drugs were exhausted with petroleum-ether, which removed chlorophyll, oil and a gelatinous, nitrogenous, inactive substance (occasionally this can be obtained crystalline); warm alcohol of 96 per cent. removed the colouring and bitter principles; after evaporating to syrupy consistence it was taken up with water and acidulated with sulphuric acid, the precipitate collected, expressed, dried at $40^{\circ}C$, and extracted in a Soxhlet apparatus for some weeks with petroleum-ether until the last traces of the above-mentioned nitrogenous substance were removed, and the residue exhausted with alcohol or ether; from this alcoholic or ethereal solution there separated after a time yellow-crystalline masses which, recrystallized several times from ethereal solution, were found to constitute the active principle. It is soluble in chloroform, ether, acetone, phenol, acetic anhydride, aniline, and alcohol; almost insoluble in cold water, slightly soluble in warm water; insoluble in petroleum-ether, benzol, and carbon bisulphide; alkalies and alkaline-earth hydrates dissolve it; from neutral or alkaline solutions it is precipitated by neutral and basic lead acetate, dialyzed iron, zinc sulphate, silver nitrate, and a saturated solution of salt, but not by alum, copper sulphate, and platinic chloride; it does not reduce Fehling's solution and does not react with Millon's reagent. Its ultimate analysis, C 59.98, H 3.54, N 4.32, O 32.16, leads to the formula $C_{32}H_{22}N_2O_{13}$. Physiologically it was found that cold-blooded animals were entirely indifferent to it; while in warm-blooded animals uræmic intoxication was produced; in this respect aristolochin is a much more powerful agent than any other substance; it resembles aloin

in its action upon the kidneys, but is about ten times more poisonous. It may probably be useful as a cathartic.

Frangulin. T. E. Thorpe and A. K. Miller. (*Proc. Chem. Soc.*, 1891-92, No. 103.) In a previous report on this subject by one of the authors (see *Year-Book of Pharmacy*, 1890, 73) it was concluded that frangulin had the composition $C_{22}H_{22}O_9$. This conclusion was based on analytical results alone, and it was, in fact, pointed out that the percentage yield of emodin obtained on hydrolysing frangulin agreed better with Schwabe's formula $C_{21}H_{20}O_9$.

The authors have now prepared a larger quantity of frangulin, and have succeeded in obtaining it more nearly in a state of purity than was previously possible. They find, however, that crude frangulin contains a substance isomeric with emodin, which clings to it very persistently, and which it is very difficult to completely remove from the frangulin: they ascribe the conflicting statements of previous experimenters to the presence of this substance.

They have succeeded in proving the correctness of Schwabe's formula $C_{21}H_{20}O_9$. Their conclusions are based not only on their more recent analyses of frangulin, but also, and in fact mainly, on the results obtained from the hydrolysis of frangulin. The two products of the hydrolysis are *emodin*, $C_{15}H_{10}O_5$, as shown in the first paper, and *rhamnose*, $C_6H_{12}O_5$. The latter substance was obtained in a crystalline form, and was identified by its chemical and physical properties and by the properties of its osazone. The percentage yield of emodin shows that one molecular proportion of frangulin yields one molecular proportion of emodin, and the difference represents one molecular proportion of rhamnose. It is thus possible to build up the formula of frangulin from its constituents, and since the result agrees with the formula deduced from the analyses of the glucoside, the conclusion is justified that frangulin has the composition $C_{21}H_{20}O_9$, and that its hydrolysis takes place in accordance with the equation $C_{21}H_{20}O_9 + H_2O = C_{15}H_{10}O_5 + C_6H_{12}O_5$, which was given by Schwabe as highly probable.

The substance which has been mentioned as clinging so persistently to the frangulin has been isolated, and is found to have the same percentage composition as emodin. It melts at 202-203°, and is, without doubt, the same substance which Schwabe found and described as melting at 199°. It differs from emodin also in that it crystallizes in golden-yellow needles, in the greater readi-

ness with which it sublimes and in its reaction with alkalies. It is probably an isomeric trihydroxymethylanthraquinone.

Coronillin. F. Schlagdenhauffen and E. Reeb. (*Journ. de Pharm. d'Als.-Lorr.*, June, 1891.) This glucoside is a non-nitrogenous, yellow, amorphous body, freely soluble in water, but rather less soluble in alcohol. It has a decidedly bitter taste. In its physiological action it closely resembles digitalin.

On treating coronillin with nitric acid to which some cupric chloride has been added, a characteristic red coloration is obtained. This is stated to be a very delicate test, admitting the detection of as little as .00025 gram of this glucoside.

Abrin and Ricin. P. Ehrlich. (*Deutsch. med. Wochenschr.*, October 29th, 1891, 1218. From *Pharm. Journ.*) The numerous points of resemblance in respect of physiological action between abrin, the poisonous albumose to which the inflammatory action of preparations of jequerry seeds upon the eye is attributed, and ricin, the albumose of castor-oil seeds, has suggested the probability of their being identical. Both possess the property of coagulating the blood in a peculiar manner, giving rise to numerous thromboses, especially in the intestinal vessels; they also affect similarly the mucous membrane of the eye, and they are both converted into non-poisonous substances by digestive ferments. Experiments made by the author have shown, however, that they are quite distinct substances. One peculiar action of abrin is to cause the loss of hair spreading round the point of injection. In toxic properties ricin was found to be about twice as powerful as abrin, but in their action on the membrane of the eye this relation is reversed. Further, it was found possible by special treatment to render an animal immune against abrin or against ricin, but the immunity against one of these albumoses does not involve immunity against the other. The practical inference drawn by the author from the results of his experiments is that by the use at first of dilute solutions of abrin and ricin, and then carefully and slowly increasing the strength, all danger to the eye in using these substances may be avoided, without diminishing the healing effect.

Adonin. Y. Tahara. (*Ber. der deutsch. chem. Ges.*, xxiv. 2579-2582.) The author has prepared the glucoside from *Adonis amurensis* in order to compare it with adonidin, the glucoside from *Adonis vernalis*. The following method of extraction was used:—The air-dried root (1.7 kilograms) was cut fine and extracted five times with 90 per cent. alcohol. On distilling off the alcohol, a

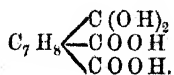
brown mass was obtained which dissolved in water. The concentrated aqueous solution was made strongly alkaline and extracted with chloroform, the chloroform distilled off, and the residue dissolved in alcohol and fractionally precipitated with ether. In this way a yellowish, gummy mass was obtained, which yielded a white powder. The yield amounted to 1.94 per cent. on the material extracted. This glucoside the author calls adonin. On analysis, it gave numbers corresponding with the formula $C_{24}H_{40}O_9$.

Adonin is easily soluble in water, alcohol, chloroform, and acetic acid, insoluble in ether. The aqueous solution has a very bitter taste. It dissolves in concentrated nitric acid with an indigo blue colour; the same coloration is obtained on adding nitric acid to the acetic acid solution; with concentrated sulphuric acid it gives a deep red, with hydrochloric acid a rose-red. In aqueous solution it is easily decomposed by mineral acids; even in the cold a few drops of hydrochloric acid convert it into a sugar and a resinous substance easily soluble in ether. Acetic acid and alkalis do not, however, decompose it. The aqueous solution is precipitated by gallic acid, picric acid, Meyer's reagent, gold chloride, etc. On shaking with benzoic chloride and potassium hydrate, it gives a benzoyl derivative. Its toxic action is similar to that of adonidin, but is weaker.

Linamarin. A. Jorissen and E. Hairs. (*Pharm. Post.*, 1891, 659, and *Académie royale de Belgique*, 1891, 529.) The authors have extracted from the embryo of linseed about 1.5 per cent. of a glucoside yielding hydrocyanic acid and sugar in its decomposition by dilute mineral acids and emulsions of linseed. This glucoside, *linamarin*, differs essentially from both amygdalin and laurocerasin, and is not acted upon by an emulsion of sweet almonds. It is soluble in an equal weight of cold water, whereas amygdalin requires twelve times its weight of water for solution; it fuses at $134^{\circ}C$. (amygdalin at $200^{\circ}C$.), does not eliminate water at $120^{\circ}C$., and can be heated to $150^{\circ}C$. without decomposition. It is not coloured by concentrated sulphuric acid, and does not yield benzaldehyde when decomposed. It contains 47.88 per cent. of carbon, 6.68 per cent. of hydrogen, 5.55 per cent. of nitrogen, and 39.89 per cent. of oxygen, and therefore less carbon and more nitrogen than amygdalin. It crystallizes in colourless needles having a cool and very bitter taste. It can be prepared as follows:—The coarsely powdered germs are repeatedly extracted with boiling alcohol of 94 per cent. and the united liquids evaporated. The residue is taken up with warm water, the resin and fat separated,

and the aqueous solution treated with an excess of lead acetate. After filtration and removal of the lead by sulphuretted hydrogen, the liquid is evaporated to the consistence of a syrup. This residue is extracted with boiling alcohol, nearly the whole of the solvent then recovered by distillation, and the remaining liquid mixed with ten times its volume of ether under constant agitation. After removing the ether by distillation, the residue is dissolved in water, the solution concentrated by evaporation, and then allowed to stand over sulphuric acid for some time. The crystals thus formed are purified by repeated recrystallization from absolute alcohol.

Anemonin. H. Beckurts. (*Archiv der Pharm.*, 1892, vol. 230, 182. From *Pharm. Journ.*) The author has investigated the acrid constituent present in various kinds of anemone and other ranunculaceous plants, and finds the sharp burning taste and irritating effects are due to a substance which he terms anemone-camphor, the composition of which has hitherto been unknown. This substance undergoes decomposition soon after its isolation, under conditions that are not precisely known, as for instance during the drying of the plants in which it occurs. The products of this alteration are anemonin and isoanemonic acid. The plants in question also contain as constituents, or as products of secondary decomposition, anemonin and two acids, anemonic and anemoninic acids. The author finds that, contrary to previous statements, the composition of anemonin is represented by the molecular formula $C_{10}H_8O_4$. According to its chemical behaviour it is to be regarded as the anhydride of a bibasic acid, and it contains an aldehyde or ketone group, but no hydroxyl or oxalkyl group. When treated with acetic anhydride, anemonin is converted into an isomeric substance, isoanemonin. Anemonin is an unsaturated compound, and it combines with four atoms of bromine without separation of hydrobromic acid. The anemonic acid $C_{10}H_{10}O_5$ present in small amount in the *Ranunculaceæ* is also formed by boiling a water solution of anemonin with lead oxide. It is bibasic, and contains either an aldehyde or a ketone group. The anemonic acid $C_{10}H_{12}O_6$ occurring in these plants is also formed by heating anemonin with acids—dilute hydrochloric or sulphuric—or with bases—potash or baryta water. It is bibasic, and its composition is probably represented by the formula—



The amorphous isoanemononic acid produced by the breaking up of anemonin camphor has the same composition as anemononic acid, from which it probably differs in the same manner that isoanemonin differs from anemonin. The investigation of these compounds will be carried out further.

Gentisin Derivatives. S. v. Kostanecki. (*Schweiz. Wochenschr. Pharm.*, xxix. 59-60, and *Monatshefte*, xii. 205-210.) On boiling gentisin with hydriodic acid, methyl is eliminated with formation of *gentisein*, $C_{13}H_5O_5$. This, on boiling with anhydrous acetic acid and sodium acetate, yields *triacetylgentisein*, $C_{13}H_5O_5Ac_3$, the formation of which proves the presence of three hydroxyl groups in gentisein, $C_{13}H_5O_2(OH)_3$, and that gentisin is a methyl ether of gentisein, $C_{13}H_5O_2(OMe)(OH)_2$. Gentisein fuses at $315^\circ C$., and triacetylgentisein at $226^\circ C$.

The author, in conjunction with E. Schmidt, also describes *dimethoxygentisein* and its acetyl derivative (*Monatshefte*, xii. 318-322).

Derivatives of Cantharidin. F. Anderlini. (*Ber. der deutsch. chem. Ges.*, xxiv. 1993-2000; *Journ. Chem. Soc.*, October, 1891.) The compound $C_{10}H_{13}NO_3$ obtained from cantharidin by the action of ammonia is now regarded as *cantharidinimide*, $C_{10}H_{12}O_3 : NH$. It is not affected by prolonged boiling with caustic alkalies or baryta, yields a series of alkyl derivatives, and, when heated with acetic anhydride at 230° for about thirty hours, is converted into a crystalline *acetyl* derivative, $C_{10}H_{12}O_3 : NAc$, which dissolves readily in alcohol, ether, and benzene, and is hydrolysed by boiling with water or aqueous alcohol. The author also describes *cantharidin methylimide*, *ethylimide*, *amylimide*, *allylimide*, *phenylimide*, and *α -naphthylimide*.

Cantharic acid.—Various methods have already been described for the preparation of this acid. It may also be prepared by dissolving cantharidin in 5 times the quantity of chlorosulphonic acid, and, after four hours, pouring the solution on to ice, neutralising with barium carbonate, and treating the filtrate with the requisite quantity of dilute sulphuric acid. Cantharic acid crystallizes in rhombic forms. When heated at 180° for 7-8 hours with a saturated alcoholic solution of ammonia, it is converted into a compound $C_{10}H_{13}NO_3$, which melts at 187° , dissolves readily in the ordinary solvents, and is isomeric with cantharidinimide.

Isocantharidin, $C_{10}H_{14}O_4$, is formed when 1 part of cantharic acid is heated with 4-5 parts of acetic chloride at 135° for three hours. It crystallizes in monoclinic forms $a : b : c = 1.0273 : 1 :$

1.1795, $\beta=59^\circ$, melts at $75-76^\circ$, and is readily soluble in alcohol, ether, and benzene, but only sparingly in boiling water.

Isocantharidic acid, $C_{10}H_{14}O_3 + H_2O$, is obtained by boiling the aqueous solution of isocantharidin for three hours until it no longer becomes turbid on cooling. It crystallizes in crusts, loses its water of crystallization at 100° , melts at 153° , and at 163° is converted into an anhydride which melts at $75-76^\circ$, and is reconverted into the acid by boiling with water. It is a bibasic acid. The *silver* salt, with 3 mols. H_2O , and the *barium* salt, with 5 mols. H_2O , are described; the *methyl* salt, $C_{10}H_{12}O_3Me_2$, melts at $81-82^\circ$, is volatile without decomposition, and dissolves in water and ether.

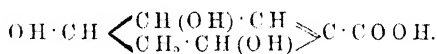
Daturic Acid and some of its Derivatives. E. Gérard. (*Journ. de Pharm. et de Chim.* [5], xxv. 8-13; *Journ. Chem. Soc.*, May, 1892.) Normal potassium daturate forms transparent, crystalline grains, soluble in a little boiling water; the solution forms a lather when shaken, and gives a precipitate with common salt. The addition of much water decomposes the salt, setting free the alkali, and retaining an acid salt in solution, which crystallizes out in colourless, crystalline laminæ. The corresponding sodium salts are very similar. Copper daturate obtained from alcoholic solutions of the acid and copper acetate forms crystalline needles, which dry to a light granular powder of a bluish-green colour. This salt is anhydrous, insoluble in water and ether, scarcely soluble in cold 90° alcohol. Normal lead daturate is obtained as a heavy, white, amorphous powder, which is not moistened by water. The salt is insoluble in cold alcohol and dry ether, and only very slightly soluble in boiling alcohol or dry ether. It melts at $104-105^\circ$ without decomposition. Silver daturate, $C_{17}H_{33}AgO_2$, obtained by precipitating an aqueous solution of the sodium salt by means of silver nitrate, forms a very voluminous, white precipitate, which, when moist and exposed to light, rapidly becomes dirty grey. When crystallized from alcohol and dried in a vacuum, it forms small, nacreous scales, which are scarcely affected by exposure to light. The salt is insoluble in water and ether, but soluble in aqueous ammonia.

Daturone, $C_{33}H_{66}O$, is obtained by distilling the acid over excess of slaked lime, when the oily distillate solidifies on cooling, and is purified by crystallization from hot 90° alcohol. It forms beautiful spangles with a pearly lustre, and melts at $75.5-76^\circ$. It is insoluble in water and in cold 75° alcohol, soluble in boiling alcohol, and very soluble in ether, benzene, and chloroform.

Monobromodaturic acid, $C_{17}H_{33}BrO_2$, was obtained by heating

daturic acid with bromine and water in a sealed tube at 134–140° for 18 hours. Neither this acid nor its sodium salt could be crystallized.

Shikimic Acid. J. F. Eykman. (*Ber. der deutsch. chem. Ges.*, xxiv. 1278–1303.) The author has previously described the mode of preparation of shikimic acid, $C_7H_{10}O_5$, and now gives a more detailed description of its properties. His research also deals with the constitution of this body, and tends to show that it must be a *trihydroxytetrahydrobenzoic acid*, $C_6H_6(OH)_3 \cdot COOH$. The position of the ethylene linkage and of the hydroxyl groups cannot be stated with certainty, but the author regards the following formula as the most probable:—



The close alliance to shikimic acid of quinic acid, $C_7H_{12}O_6$, and of quinic acid, $C_7H_{10}O_5$, is confirmed.

Angelic Acid. E. Schmidt. (*Archiv der Pharm.* [2], xxix. 68–71.) The author doubts the existence of this acid in the free state or as an ethereal compound in angelica root, but regards it as a decomposition product of a constituent of the root which has not yet been isolated. He also shows that the acid can be kept for many years without undergoing any change, though it is readily converted into methylecrotonic acid by the application of heat.

Picrotoxic Acid and Picrotin. A. Ogliastro and O. Forte. (*Gazz. Chim. Ital.*, xxi., II. 213–215. From *Journ. Chem. Soc.*) *Picrotoxic Acid*, $C_{15}H_{18}O_4$, is obtained by warming a mixture of picrotin (prepared by the action of potash on picrotoxin), amorphous phosphorus, and hydriodic acid, allowing the brisk effervescence which takes place at first to subside, and then boiling for about ten hours in a reflux apparatus. On diluting the product with water, steam-distilling, and filtering the residue, the filtrate, on cooling, leaves a white deposit of picrotoxic acid. This crystallizes from dilute alcohol in lustrous, white needles, melts at 134°, dissolves readily in alcohol, but only sparingly in hot water. It has a feebly acid reaction, and dissolves in alkalis, but is reprecipitated from its solutions on the addition of an acid. The *silver salt*, $C_{15}H_{17}O_4Ag$, is a white crystalline powder, sensitive to light. The formation of this acid affords additional proof of the formula $C_{15}H_{18}O_7$ for picrotin.

The Tannic Acid of Oak-Wood. C. Böttinger. (*Liebig's Annalen*, cclxiii. 108-125.) This paper deals with several derivatives of oak-tannin described under the names of *hydroquercic acid*, *querlactone*, and *hydroquergallic acid*. For particulars reference should be made to the original.

The Tannin of Chestnut-Wood. H. Trimble. (*Chemist and Druggist*, March 12th, 1892, 381.) The author has extracted this tannin, and has carefully investigated its properties. He arrives at the conclusion that it is identical with gallotannic acid.

The Tannin of *Pinus Maritima*. M. Crouzel. (*Bulletin des travaux de la Société de Pharmacie de Bordeaux*, May, 1892; *Pharm. Journ.*, 3rd series, xxii. 11.) The tannic acid of *Pinus Maritima* belongs to the group of physiological tannins giving a green precipitate with ferric salts. The greater part of the tanno-metallic precipitates obtained with the acid are remarkably lighter than other similar tannates. The same is the case with the gelatinous precipitates.

Conversion of Gallic Acid and Tannin into Benzoic Acid. C. E. Quignet. (*Comptes Rendus*, cxiii. 200-201.) On warming zinc dust with a solution of ammonia, then adding a warm solution of either gallic acid or tannin, and heating the mixture to 60° C. and maintaining it at that temperature for several hours, benzoic acid is formed. This conversion is found to be complete. The change from gallic acid to benzoic acid is a direct one, whereas tannin is first converted into gallic acid and subsequently into benzoic acid.

Hydrotannic Acid. C. Böttinger. (*Archiv der Pharm.*, cxxix. 445-447.) Hydrotannic and isohydrotannic acids are obtained when 20 grams of tannin are mixed with 30 grams of potassium hydrogen sulphate and 30 grams of glycerol, and heated at 190-200° for 54 minutes. The fused mass is extracted with water and the residue dried and extracted with absolute alcohol; this extract is evaporated and the semi-liquid residue is treated with much alcohol and ether; isohydrotannic acid is thus precipitated, whilst the hydrotannic acid remains in solution, and is precipitated by pouring the solution into water.

The *hydrotannic acid*, $C_{14}H_{14}O_7 + H_2O$, is purified by dissolving it in acetic acid and precipitating it again by the addition of water and a few drops of hydrochloric acid. It is a brown powder, which dissolves easily in cold alcohol, dilute acetic acid, and warm acetic anhydride, but not in water; when heated with zinc dust it gives the same sharp odour which was noticed with *hydroquercic acid*. It dissolves in ammonia with a brown colour; the solution

absorbs oxygen, and is reprecipitated by acetic and hydrochloric acids. It yields a yellow *acetyl* derivative, $C_{14}H_{10}Ac_4O_7$, when heated with acetic anhydride at 100° .

Isohydrotannic acid, $C_{14}H_{14}O_7$, is insoluble in cold water and absolute alcohol, but dissolves slightly in hot water, and easily in hot, aqueous alcohol; it behaves similarly to hydrotannic acid, and yields a brown *acetyl* derivative, which is probably $C_{14}H_{11}Ac_3O_7$.

The author concludes that these acids have high molecular weights, are not glycerides, and contain no glycerol residue.

Chlorophyll. E. Schunck. (*Pharm. Journ.*, 3rd series, xxii. 815.) The author describes the product resulting from the action of alkalies on chlorophyll, which he calls *alkachlorophyll*. It shows, in solution, a remarkable degree of permanence when exposed to the action of air and light, as compared to chlorophyll. It exhibits no signs of crystalline structure, is quite insoluble in boiling water and in petroleum ether, but soluble in alcohol, ether, chloroform, benzol, anilin, and carbon bisulphide. Its solutions have a brilliant green colour, with a pronounced bluish tinge and a marked red fluorescence. The ethereal solution shows no less than six absorption bands.

Quercetin. J. Herzig. (*Monatshefte*, xii. 172-176 and 177-190.) The author has redetermined the composition of this body, and arrives at the conclusion that the formula hitherto assigned to it should be given up in favour of $C_{15}H_{10}O_7$.

Aspergillin, a Vegetable Hæmatin. G. Linossier. (*Comptes Rendus*, cxii. 807-808.) See also *Year-Book of Pharmacy*, 1891, 107. Phipson has stated that he considered the author's aspergillin as probably identical with *palmelline*, obtained from *Palmella Cruenta* (abstract, *Year-Book of Pharmacy*, 1891). The author has now investigated this matter, and shows that these two bodies differ essentially in their physical and chemical properties, and therefore cannot be identical. He further states that *palmelline* is not analogous to hæmatin.

Isatin-Blue. C. Schotten. (*Ber. der deutsch. chem. Ges.*, xxiv. 1336-1373.) On heating an alcoholic solution of isatin with two molecular proportions of piperidine for an hour, crystals of *dipiperidylisatin*, $C_{18}H_{25}N_3O$, are obtained. By heating this product with acetic anhydride and absolute ether in sealed tubes at 100° , isatin-blue is formed, the composition of which corresponds to the formula $O_{36}H_{30}N_5O_4$. It can also be prepared by shaking dipiperidylisatin with several times its weight of acetic anhydride in a closed flask, at an ordinary temperature, then pouring into

water, collecting the precipitate and washing it with water. Its formation and constitution require further investigation.

Artificial Musk. A. Baur. (*Chemist and Druggist*, January 30th, 1892.) The body described under this name is trinitrobutyltoluene, $C(CH_3)_3 C_6H_4 C H_3 (NO_2)_3$. It is obtained when tertiary butyltoluene is slowly added in the cold to five times its weight of a mixture of 1 part of nitric acid (sp. gr. 1.500) and 2 parts of 15 per cent. anhydrosulphuric acid, and the mixture afterwards heated for eight to nine hours on a water-bath. It crystallizes from alcohol in yellowish-white needles, melts at 96° to 97° , and is only very slightly volatile with steam. It is insoluble in water, but dissolves readily in alcohol, ether, benzene, chloroform, and light petroleum.

Terpenes. G. Wallach. (*Ber. der deutsch. chem. Ges.*, xxiv. 1525-1579; *Journ. Chem. Soc.*, September, 1891, 1078-1084.) The present paper deals with the terpenes $C_{10}H_{16}$. At present the following terpenes are known:—(1) Pinene, (2) camphene, (3) fenchene, (4) limonene, (5) dipentene, (6) sylvestrene, (7) phellandrene, (8) terpinene, (9) terpinolene. *Pinene* forms the main constituent of ordinary turpentine oil, occurs as an essential ingredient of the ethereal oils of most pines, and in greater or smaller quantity in many other ethereal oils. *Camphene* is important on account of its near relation to camphor. It is obtained from camphor through borneol or from pinene. It does not appear to occur in nature. *Fenchene* is closely related to camphene, and is obtained in a similar way from fenchone, a compound isomeric with camphor. *Limonene*, one of the most widely diffused terpenes, occurs in the ethereal oils of the *Awantiaceæ*, in orange-peel oil, in oil of lemons, bergamot, camin, dill, oil of *Erigeron canadense*, and in the oil of fir needles. *Dipentene* is closely related to limonene. It is formed from limonene and pinene by the action of heat or of acids, and occurs in oil of camphor and elemi, in Russian and Swedish turpentine, and is formed together with isoprene by the dry distillation of caoutchouc, and as a by-product in the formation of cineole, terpene hydrate, and terpineole. *Sylvestrene* occurs in Russian and Swedish turpentine. *Phellandrene* occurs in the oils of bitter fennel and water fennel, elemi, and eucalyptus. *Terpinene* is a product of the molecular change of other terpenes. It occurs naturally in oil of cardamom. *Terpinolene* is only slightly known.

An elaborate account is given by the author of the most important results obtained up to the present time in the investigation

of these bodies. For this the reader is referred to the sources above named.

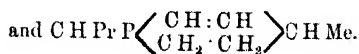
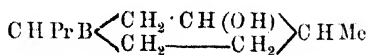
New Compounds of the Camphor Series and a New Terpene.

O. Wallach. (*Liebig's Annalen*, cclxiii. 129-156.) The main portion of this paper is devoted to a study of the properties of *fenchone* (previously described under the name of fenchol), and of a number of derivatives of this substance. Many additional points of resemblance between this body and its isomeride, camphor, are referred to; but the exact relationship between the two compounds remains still to be solved.

The new terpene referred to is *fenchene*, $C_{10}H_{16}$, which is obtained, together with phenylfenchylamine, when fenchyl chloride is heated with aniline. It differs from other terpenes in being comparatively stable towards concentrated nitric acid, oxidation taking place only on warming.

Terpenes and Essential Oils. O. Wallach. (*Liebig's Annalen*, cclxiv. 1-32.) In this paper an account is given of several bromine derivatives of pinene, limonene, and dipentene. For particulars reference should be made to the above source.

Terpenes and their Derivatives. J. W. Brühl, H. Biltz, A. Cantzler, and L. Renter. (*Ber. der deutsch. chem. Ges.*, xxv. 142-151. From *Journ. Chem. Soc.*) Menthene, which stands in the same relation to menthone as camphene to camphor, may be readily obtained by the action of dehydrating agents on menthol, phosphoric anhydride acting at the ordinary temperature, and zinc chloride at the boiling point. Concentrated sulphuric acid, on the other hand, even in the cold, gives very little menthene, the chief product having a much higher boiling point. Anhydrous copper sulphate may also be employed with good results. To purify the menthene, it is heated with sodium on an oil-bath, and distilled over the metal in a vacuum; it boils at 167.1° under a pressure of 768.6 mm., and when heated with anhydrous copper sulphate at 250° , is converted into cymene. As menthol so readily loses water, the reaction probably takes place between the hydroxyl group and the hydrogen atom in the ortho-position, the constitution of menthol and menthene being represented by the following formulæ:—



Terebenthine was prepared from French oil of turpentine by shaking it with soda solution, drying over solid soda, and heating in an oil-bath with sodium until the surface of the latter remained bright. The product was then distilled, and two fractions collected boiling at 155.4 – 155.8° and 155.8 – 156.1° , under a pressure of 748.9 mm. The purified terebenthine was converted into the monohydrochloride by saturating it with hydrogen chloride at -20° , filtering off the mother liquor at the same temperature, and washing with alcohol; the product may be purified by dissolving in light petroleum, filtering from separated water drops, and allowing to crystallize; it melts at 125° . Terecamphene was first prepared from this hydrochloride by Berthelot, by heating it with sodium stearate; if benzoate or acetate is employed instead of the stearate, inactive camphene is obtained. Alcoholic ammonia is without action on the hydrochloride, and aniline, contrary to the statement of Lauth and Oppenheim, has very little action. The hydrocarbon may be obtained by heating the hydrochloride with an equivalent quantity of sodium acetate and a slight excess of soda in alcoholic solution at 180 – 200° for 6–8 hours. The corresponding potassium salts have the same effect, but the action is much slower and less complete. When the product is distilled in a current of steam, camphene passes over, and solidifies on cooling. After treatment with soda, distilling over sodium, and repeated crystallization, it melts at 51 – 52° , and boils at 158.5 – 159.5° .

Borneocamphene was prepared from bornyl chloride by Wallach's method, which does not, according to the author, proceed so readily as stated by the former. The product always contains chlorine, and must be purified by treatment with soda and distillation over sodium. It then melts at 53.5 – 54° , instead of 48 – 49° , as given by Wallach.

In order to redetermine the physical properties of cymene for comparison with those of the terpenes, this substance was also prepared in quantity from camphor and from cumin oil. From the first source a fraction was obtained boiling at 175 – 176° , and from the second two fractions boiling at 174.5 – 175.2° and 175.2 – 175.9° , under a pressure of 752 mm.

Terpenes from the Resin of *Pinus Abies*. B. Kuriloff. (*Journ. prakt. Chem.* [2], xlv. 123–133.) The author's results lead to the conclusion that the oil from the resin of *Pinus abies* contains inactive terpene and lævorotatory isoterpene, together with substances containing oxygen which were not examined.

Massoyene. O. Wallach. (*Archiv der Pharm.*, cxxix. 116-120.) The author re-asserts the non-existence of massoyene in the rind of massoya. He also states that the oil from this rind contains a large proportion of pinene accompanied by limonene and perhaps dipentene.

Constitution of Cymene. M. Fileti. (*Journ. prakt. Chem.* [2], xlv. 150-152.) The experiments described in this paper lead to the conclusion that cymene is an isopropyl derivative, thus confirming the results obtained by Widman.

The Alleged Conversion of Cymene into Camphor. G. Oddo. (*Gazz. Chim. Ital.*, xxi. II. 567-569.) The author has attempted to verify Oppenheim's statement that the oxidation of cymene by chromic acid yields a body possessing the properties of camphor. He has, however, obtained negative results, and concludes that the cymene obtained by Oppenheim must have contained some terpenes.

Benzoyl and Cinnamyl Eugenol. (*Pharm. Journ.*, from *Pharm. Centralhalle*, 1891, 365.) Benzeugenol is described as crystallizing in colourless and odourless needles, having a weak bitter taste, being neutral in reaction and melting at 70.5° C. It is almost insoluble in water, and freely soluble in hot alcohol, chloroform, ether, and acetone. With concentrated sulphuric acid it gives the purple-red colour characteristic of eugenol, this reaction distinguishing it from benzosol, which gives only a pale yellow colour. Cinnamylengenol forms shining needles, which are colourless, odourless and tasteless, neutral in reaction, and melt at 90°-91°. It is scarcely soluble in water, but freely in hot alcohol, chloroform, ether, and acetone. With concentrated sulphuric acid it gives a purple-red colour like benzeugenol, but it may be distinguished by the different melting-point. Both compounds are readily saponified with alcoholic potash.

These preparations are stated to be likely to come into use in the treatment of tuberculous affections.

Preparation of Carvacrol. A. Reyhler. (*Bull. de la Soc. Chim.* [3], vii. 31.) Carvol hydrochlorate is mixed with 1½ to 2 per cent. of anhydrous zinc chloride and about 30 per cent. of glacial acetic acid, and the mixture heated in a flask connected with a reversed condenser. Hydrochloric acid is evolved between 95° and 120° C. The greater part of the acetic acid is recovered by crystallization, and the remainder together with the zinc chloride is removed by treatment with water. The carvacrol is

then separated by distillation. About 90 per cent. of the theoretical yield can be thus obtained.

Crystalline Products from Lemon and Bergamot Oils. L. Crismer. (*Bull. Soc. Chim.* [3], vi. 30-33) The residue from the distillation of lemon oil at a pressure of 10 mm. is dissolved in light petroleum; this solution deposits nodular crystals of the composition $C_{10}H_{10}O_4$, which when purified by recrystallization from anhydrous ether, form a white, crystalline, inodorous powder which melts at 144° , and neither decomposes nor sublimates when heated at 240° . Sulphuric acid colours this substance, which is hesporetic acid, golden-yellow; a trace of nitric acid possibly changes this to green, or a trace of potassium permanganate to blue, which subsequently becomes green. The light petroleum leaves on evaporation a butter-like mass, fusing at about 50° , and this, after purification by recrystallization from alcohol, has a lemon-like odour, and gives a dark-brown coloration with ammoniacal manganous solutions, differing in this respect from the substance $C_{10}H_{10}O_4$. Bergamot oil, when similarly treated, affords white, crystalline needles which melt at 184° , sublime at $230-240^\circ$, and have the percentage composition C 65.24, H 3.78, O 30.98. This substance does not appear to be the bergaptene of Mulder and Ohme, which melts at 206° .

Menthol. A. Berkenheim. (*Ber. der deutsch. chem. Ges.*, xxv. 686-698.) The author's research shows menthol to be connected with the naphthenes; the particular naphthene obtained from it must have a ring of 6 carbon atoms, since menthol can be converted into cymene. It is also connected with the terpenes, for terpine hydrate yields an alcohol, $C_{10}H_{20}O$, much resembling menthol; and menthol has yielded a hydrocarbon, $C_{10}H_{16}$, possessing the properties of a terpene.

Oxygenated Constituents of Several Volatile Oils. F. W. Semmler and F. Tiemann. (*Chem. Ztg.*, Rpt., 1892, 147; *Amer. Journ. Pharm.*, June, 1892.) Oil of Bergamot by ultimate analysis yielded 78.53 per cent. of carbon, and 11.17 per cent. of hydrogen; distilled under a pressure of 15 mm. decomposition is avoided and there remains as a residue about 5 per cent. of bergaptene; the first fraction $60-65^\circ$, about 40 per cent. has a lemon odour and consists of almost pure limonene, $C_{10}H_{16}$; at $77-82^\circ$ the fraction consists principally of dipentene, $C_{10}H_{16}$, about 10 per cent.; the third fraction of about 25 per cent., distilling between $87-91^\circ$, has an odour resembling that of the oil (but to which the characteristic odour is not due), and consists of an

unsaturated alcohol, *linalool*, $C_{10}H_{18}O$; the fraction 99–105°, approximated 20 per cent., had the pronounced bergamot odour, and was found to consist of *linalool acetate*, $C_{10}H_{17}O \cdot C_2H_3O$.

Oil of Petitgrain.—The examined oil was partly of French, partly of South American origin; it yielded by combustion 76·47 per cent. of carbon and 11·14 per cent. of hydrogen; the chief constituent (about 70 per cent.) boils at 102–106° under a pressure of 15 mm., has an agreeable, peculiar odour, has the composition $C_{10}H_{17}O \cdot C_2H_3O$, and is called *aurantiol acetate*. This ester submitted to saponification yielded *aurantiol*, $C_{10}H_{18}O$. The latter is an unsaturated alcohol, has a peculiar odour, combines with four atoms of bromine, boils at 93–95° (15 mm. pressure), is *lævogyre*, and at 20° C. has the specific gravity 0·8691. Besides this ester there are present in the oil a higher boiling sesqui-terpene and other oxygenated constituents which naturally modify the odour of the *aurantiol acetate*.

Oil of Lavender, of English origin, contained 77·53 per cent. of carbon and 11·47 per cent. of hydrogen; the very first portions of the distillate (15 mm. pressure) contained terpenes, among which *limonene* was identified; the principal fraction, 85–91°, consisted of an unsaturated alcohol, $C_{10}H_{18}O$, called *lavendol*, which has a specific odour, a density of 0·8672 at 20° C., and is *lævogyre*; at 97–105° a fraction (about 10 per cent.) was obtained, which proved to be *lavendol acetate*, specific gravity 0·8972 at 20° and *lævogyre*; higher boiling constituents were *sesqui-terpene*, and other oxygenated products, to which in part is due the characteristic odour of the oil.

The physical and chemical properties of *linalool*, *aurantiol*, and *lavendol*, which so closely agree, suggest that they are identical; by reduction they yield aldehydes or ketones of the formula $C_{10}H_{16}O$, having the odour of *geraniol*, and from which they cannot be positively distinguished. The alcohols, under various influences, retain their characteristic odour and certain physical differences, so that they at present cannot be considered as being identical.

Limettin. W. A. Tilden. (*Proc. Chem. Soc.*, 1891–1892, No. 107.) Limettin is the name given by the author to a crystalline substance deposited from the essential oil of the lime, originally described by him in conjunction with C. R. Beck.

Further investigation of its properties shows that, instead of the formula $C_{16}H_{14}O_6$ first attributed to it, limettin has the composition expressed by the molecular formula $C_{11}H_{10}O_4$, which requires nearly the same percentages of carbon and hydrogen.

By the action of nitric acid it is converted into a nitro derivative $C_{11}H_9(NO_2)O_4$, and by the action of bromine into a dibromo-derivative $C_{11}H_8Br_2O_4$, while chlorine converts it into a trichloro-compound $C_{11}H_7Cl_3O_4$. The dibromo-compound also exchanges the third atom of hydrogen for chlorine, giving $C_{11}H_7Br_2ClO_4$. Oxidising agents convert limettin into acetic or oxalic acid without definite intermediate products. Potash fusion produces from it phloroglucol and acetic, but no other acid. Treatment with concentrated solution of hydrogen iodide causes the elimination of two methyl groups.

Sulphuric acid slightly diluted causes limettin to assimilate a molecule of water, forming a phenolic compound, of which the diacetate was prepared and analysed.

Limettin is not attacked by acetyl chloride, by phenylhydrazine, or by sodium amalgam, and it gives no coloration with ferric chloride. It forms very pale-yellow, thin prisms, which melt at 147.5 ; it dissolves in alcohol, benzene, toluene, and acetic acid pretty freely, but scarcely in water or in light petroleum. Dilute solutions exhibit a beautiful violet fluorescence. It seems to have the constitution $C_6H_3(OC_2H_5)_3 \cdot C_3H_3O_2$. Further experiments are in progress.

Menthylamine. O. Wallach. (*Ber. der deutsch. chem. Ges.*, xxiv. 3992-3993.) This body is obtained by heating menthone with ammonium formate to $190-200^\circ C$., maintaining the mixture at this temperature for several hours, and then treating the resulting product with alcoholic potash. It is a colourless oil, having a specific gravity of 0.862 at $20^\circ C$., and boiling at $208-209^\circ C$. It readily absorbs carbonic acid from the air. The numbers obtained in its analysis show that its composition corresponds to the formula $C_{10}H_{19}NH_2$.

A New Method of Preparing Salol. MM. Wierp and Ernert. (*Pharm. Centr.*, xxxiii. 27.) The authors find that if salicylic acid be heated to a temperature of $160^\circ-240^\circ$ without access of air, it is converted into salol by loss of water and carbon dioxide. The yield of salol thus obtained amounts nearly to the theoretical quantity. The product is purified by washing with water, or, if necessary, with soda solution and then by crystallization from alcohol.

Derivatives of Salol. W. Knebel. (*Journ. prakt. Chem.* [2], xliii. 378-389.) The author describes several phenyl compounds of nitrosalicylic acid, and some of their derivatives. For particu-

lars, reference should be made to the original. The author's attempts to obtain a trinitrosalicylic acid proved unsuccessful.

The Solvent Action of Sodium Salicylate on Various Preparations. A. Conrady. (*Amer. Journ. Pharm.*, from *Pharm. Zeitung*, 1892, 180.) The author's experiments were made with a concentrated solution of sodium salicylate containing equal weights of this salt and water.

Fluid extract of cascara sagrada will mix clear with this solution, and can then be diluted with water in all proportions.

Carbolic acid will also readily dissolve in it, and is then miscible with water in all proportions; a solution containing 80 per cent. of carbolic acid no longer acts as a caustic if placed upon the skin.

Creasote will also dissolve in any proportion; a mixture of equal parts of creasote and sodium salicylate solution has a syrupy consistence and can be made into a good pill mass by addition of powdered liquorice; these pills have the advantage that they remain soft for a long time and that the creasote cannot be pressed out mechanically.

Menthol and *thymol* show a similar behaviour. The volatile oils also are soluble in this solution, but owing to their variable chemical composition not in all proportions. Experiments are being made to see if this behaviour will allow of a method for the examination of essential oils.

Boric Acid as a Plant Constituent. A. Gassend. (*Ann. Agron.*, xvii. 352-354.) The frequent occurrence of boric acid in the vegetable kingdom reported upon by E. Hotter (abstract *Year-Book of Pharmacy*, 1891, 107), is confirmed by the author, who has detected it in a great variety of wines, as well as in grapes, apples, potatoes, radishes, lettuce, and occasionally also in pears.

Cause of the Acidity of Unripe Grapes. C. Ordonneau. (*Bull. Soc. Chim.* [3], vi. 261-264.) The juice from unripe grapes is found to contain both malic and tartaric acids, in some instances more of the former than of the latter. As the grapes ripen the malic acid disappears.

The Presence of Starch in Boletus Pachypus. E. Bourquelot. (*Journ. de Pharm.* [5], xxiv. 197-199.) Thin sections of the foot and cap of this fungus stained with iodine solution gave a blue coloration, due to the presence of starch in the tissue. On boiling the fungus with water, the filtered solution produced a precipitate with alcohol, which, when redissolved in water, gave a blue coloration with iodine solution; a second portion mixed

with fresh saliva (diastase solution) lost its property of becoming blue with iodine solution after a short time, whilst a third portion, treated with saliva and kept at the laboratory temperature for ten hours, acquired the power of reducing alkaline copper solution.

This is one of the few instances in which starch has been detected in fungi.

Formation and Transport of Carbohydrates in Plants. W. Sapoznikow. (*Pharm. Journ.*, 3rd series, xxii. 108.) The author gives the result of experiments on this subject made on the sunflower and gourd. He finds the decrease in the amount of these substances, when leaves are deprived of light, to be only one-fifth in detached leaves compared to what it is in leaves still attached to the plant. The energy of the conversion of starch into glucose shows a daily periodicity, which reaches its maximum between 7.30 and 9.30 p.m., and its minimum between 12 and 5.30 p.m., the maximum of this function being at an earlier period of the day than the maximum of growth. The presence of glucose in the cells hinders the action of the diastatic ferment in the further conversion of starch into glucose. The energy of the formation of carbohydrates in the leaves appears to be greatly influenced by the weather, being very much greater with a clear sky and a large amount of light. With the increase in the amount of carbohydrates in the leaves, the energy of assimilation proportionately decreases. Quantitative experiments show that the whole of the carbon of the carbonic acid decomposed is not used up in the formation of carbohydrates; there must be a second product of assimilation, which is probably a proteid.

Fermentation of Starch and Production of Amyl Alcohol induced by a Bacterium. L. Perdrix. (*Chem. Centr.*, 1891, ii. 252-253. From *Journ. Chem. Soc.*) The author has separated from Paris water a bacillus, *B. amylozymicus*, which ferments starch, with production of amyl alcohol. It is separated by cultivation on potatoes, and finally on gelatin. The bacillus is 2-3 μ long, and 0.5 μ thick; the rods are joined in pairs and chains, and in the absence of oxygen are motile, like *Vibrio butyricus*. The rods are readily stained; the spores are set free through the dissolution of the walls of the mother cell. The bacillus flourishes only in the absence of oxygen, readily, however, either in a vacuum or in hydrogen, nitrogen, or carbonic anhydride. The optimum temperature is 35°; it grows quite well at 20-25°; at 16-17°, fermentation commences at the end of four days. Its "maximum"

temperature is 42–43°. It will grow in all the usual cultivating media, ferments the sugars and starch, but does not attack cellulose or calcium lactate, differing in this respect from *Vibrio butyricus*. Acids are produced during the fermentations which it causes, and the presence of acidity, equivalent to 0.055 gram of sulphuric anhydride, or of alkali equivalent to 0.08–0.11 gram in 100 c.c., is sufficient to arrest the process; the addition of calcium carbonate to the liquid enables the fermentation to become perfect. Glucose ferments to hydrogen, carbonic anhydride, acetic and butyric acids during the first three days; from the third to the ninth day, no acetic acid is formed. From saccharose and lactose, acetic acid is formed during the first five days. The greater the amount of oxygen present, the more acetic acid is produced; it was also observed that at the time of the butyric acid formation, all the cells contained spores. From the fermentation of starch a distillate was obtained, of which one-third was amyl alcohol, and from 100 grams of potatoes, 2.3–2.5 c.c. of alcohols were separated. The sugar obtained from starch is very similar to glucose, but has a less rotatory action, and its phenylglucosazone melts 10° lower than that from glucose; 94 per cent. of the starch is converted into sugar, carbonic anhydride, ethyl and amyl alcohols, acetic and butyric acids, and 6 per cent. is converted into dextrin. The sugar formed by the bacillus from starch may be fermented perfectly with beer-yeast, either after sterilization, or in the presence of the bacillus. If either the sugar obtained by fermentation of starch with this bacillus, or a sterilized mash, be fermented with a pure cultivation of yeast, no fusel oil is formed, and the author concludes that the fusel oil found in commercially prepared alcohol is formed by the action of bacteria. The *B. amylozymicus* remains uninjured for ten days at 50–55°.

Occurrence of a Digestive Ferment in the Pineapple. R. H. Chittenden, E. P. Joslin, and F. S. Meara. (*Trans. Conn. Acad.*, viii. 1–28.) The authors call attention to the presence in pineapple juice of a ferment having a powerful proteolytic action on meat, fibrin, white of egg, etc., and possessing also the power of curdling milk like rennet. It is most active at 40° C. and in neutral solutions. The presence of acids or alkalies, however, does not materially impair its action. The ferment is precipitated from the juice, along with the proteids, by saturation with ammonium sulphate. The precipitate, freed from excess of salt by dialysis, acts on proteids like the original juice. It is also precipitable by sodium chloride.

The Presence of a Diastatic Ferment in Plants. J. Wortmann. (*Pharm. Journ.*, 3rd series, xxii. 30.) The author argues against the invariable presence of a diastatic ferment in plants, essential to the decomposition of starch. He maintains that not only can starch be absorbed without the assistance of diastase, but that diastase may occur where it can have no physiological function in connection with the absorption of starch.

For the demonstration of the presence of diastase, he recommends that the part of the plant in question be extracted, after being thoroughly crushed, with an equal volume of water, and that, except where large quantities of starch, mucilage, or albuminoids are present, the extraction should not last for more than from two to three hours in the cold. The presence of diastase is then shown by its action on starch.

From a very large number of experiments made for the purpose, the author finds the general result that in reserve receptacles where large quantities of starch are stored up, such as seeds, tubers, and rhizomes, diastase is also present in considerable quantities; while, on the other hand, it is not found in assimilating leaves, where also much starch is present, the disappearance of starch from these organs not being dependent in any way on the action of diastase.

Myrosin. Dr. Schlicht. (*Pharm. Zeitung*, 1892, 232; *Amer. Journ. Pharm.*, May, 1892.) While making determinations of myronate of potassium in rape-seed oil-cake, the author noticed that the development of oil of mustard notably increased if the water used in the maceration of the oil-cake was slightly acidified with tartaric acid; an excess of tartaric acid diminished or prevented the formation of oil of mustard. Experiments with isolated myrosin led to the conclusion that this is a mixture, since its aqueous solution with small quantities of tartaric acid forms a very heavy, curdy precipitate, which was insoluble in water and had no action upon myronate of potassium, while the filtrate from this precipitate retained its full power of decomposing myronate of potassium. As yet it has not been possible to produce the ferment in the pure state.

Assimilation of Free Nitrogen by Plants in its Dependence on Species, on Nutrition, and on Soil. B. Frank. (*Landw. Jahrb.*, xxi. 1-44; *Journ. Chem. Soc.*, March, 1892.) The author arrives at the following conclusions:—All plants assimilate free nitrogen, but some of them require nitrogenous manures. There is only one plant (yellow lupin) which assimilates more nitrogen

when grown in nitrogen-free soil than in presence of combined nitrogen. Peas, and probably most *Leguminosæ*, yield large amounts of nitrogen only when supplied with combined nitrogen (especially nitrates), but the amount required is less than is generally supposed. Lupins should only be grown in poor soils; peas, red clover, and probably many other *Leguminosæ* give better results when grown in good soils; the more these plants are strengthened by the application of combined nitrogen, the more free nitrogen they will be able to assimilate. Non-leguminous plants can only be made to recover from the state of hunger when grown in nitrogen-free soil by the application of combined nitrogen: when they have thus gained strength, they assimilate free nitrogen. Leguminous plants, on the other hand, recover from this period of nitrogen hunger, not only when they are supplied with combined nitrogen, but also when they are infected with the leguminous nodule fungus.

Nitrification. R. Warington. (*Pharm. Journ.*, 3rd series, xxii. 86-88.) In a lengthy memoir on this subject communicated to the Chemical Society, the author arrives at the following conclusions:—

1. The nitrification occurring in a mass of aerated soil, or produced by seeding with soil a cold, weak, ammoniacal solution, is purely nitric in character. If the ammoniacal solution is strong, or the temperature raised, a large quantity of nitrous acid is produced, which is finally converted into nitric acid. Soil readily converts a solution of nitrite into nitrate.

2. Pasture soil produces nitrites more readily than arable soil.

3. A clay subsoil, down to four feet from the surface, was found to produce nitrates.

4. In 1878 ammoniacal cultures were obtained (a third or fourth from one seeded with soil), yielding only nitrites, which remained permanent. Subsequently other cultures were in the same condition.

5. Such nitrous cultures produce nitrites alone in solutions of ammonia, asparagine, urine, and milk. Their action is not altered by cultivation in shallow liquids with abundant aëration, or by a temperature of 30°.

6. It is difficult to prove that no trace of nitric acid is produced by this nitrous agent, from the want of a sufficiently good analytical method. If a small quantity of nitrate is formed it must be as a bye-product, as the nitrous agent does not oxidize nitrites.

7. It was at first thought that the age of the culture was the

factor which determined the loss of the power of producing nitrates, but this idea was negated by subsequent experiments. Successive cultivations in an alkaline solution (as ammonium carbonate) were found to be a certain method of obtaining the purely nitrous agent.

8. The production of nitrites by the above-mentioned agent is not due to a process of reduction; it readily takes place in inorganic ammoniacal solutions.

9. After the nitrification of an ammoniacal solution, if not too weak, gelatinous flocks frequently appear at the bottom of the vessel. If precipitated calcium carbonate has been introduced, it assumes a curdled appearance, and when treated with acid the gelatinous matter is left. When highly magnified, the jelly is seen to consist of highly refractive, circular corpuscles.

10. A large number of organisms, from many sources, obtained as pure cultures on gelatin, were introduced into ammoniacal solutions, but no nitrification was in any case obtained.

11. Successive cultivations, the first seeded with soil, were made in an inorganic ammonium carbonate solution, supplied with phosphates, etc.; the product became wholly nitrous at the second culture.

12. The organisms seen in these ammonium carbonate cultures were chiefly cocci, oval or round, the latter the smaller, and staining more deeply.

13. When such ammoniacal cultures were spread on gelatin, or on agar-agar, no such cocci appeared, although the composition of these media had been specially contrived to agree with that of well-known nitrifiable solutions. From several of the ammoniacal cultures only a single species of bacillus was obtained by cultivation upon gelatin or agar-agar.

14. None of the growths obtained on gelatin from nitrified solutions were found to produce nitrification when introduced into suitable liquid media, nor when placed on marble moistened with an ammoniacal solution.

15. Broth, and broth with solution of ammonium carbonate, were seeded with the nitrified cultures, and examined microscopically. The bacilli present in the cultures used as seeds were greatly developed in the broth; besides these, only small, dark points were seen in the stained preparations. The mixture of broth and ammonium carbonate readily nitrified.

16. Three series of trials to separate the nitrifying organism by the dilution method failed; a fourth, in which an ammonium

chloride solution with calcium carbonate was the culture liquid, succeeded. Out of twenty solutions, ten nitrified, and of these three gave no growth on gelatin.

17. The organism thus separated oxidizes ammonia to nitrous acid only; it is, in fact, the nitrous agent studied in the author's early experiments. Solutions of a nitrite seeded with this organism do not yield nitrate.

18. The nitrous organism grown in broth containing calcium nitrate did not reduce the nitrate to nitrite.

19. The nitrous organism does not grow on gelatin, or on agar-agar. It grows slowly in weak broth, but without impairing its transparency, or producing any other visible change.

20. The pure nitrous organism is capable of producing nitrous acid in solutions of asparagine, milk, urine, and urea; the last mentioned was apparently the most difficult to attack. The nitrification of the milk and asparagine made slow progress. All the cultivations of the pure organism were free from turbidity.

21. The nitrous organism occurs as nearly circular corpuscles, varying from minute points up to nearly $1.0\ \mu$ in diameter, sometimes double when division is approaching; these circular organisms stain deeply. It may also occur as oval cocci, the length frequently exceeding $1.0\ \mu$, and the ends not unfrequently more or less truncated. There may also occur very irregular and broken forms which take stain but feebly.

22. When the mixed organisms of soil are present in an ammoniacal solution, nitrification is hindered by the presence of a tartrate.

23. The nitrous organism will readily develop, and oxidize ammonia to nitrous acid, for apparently an unlimited number of successive generations, in solutions to which no organic matter has been added, but phosphates are essential for this development. Winogradsky has supplied quantitative proof that the organism produces organic matter from inorganic materials, and finds on an average about 35 parts of nitrogen oxidized for 1 part of carbon assimilated from ammonium carbonate. The energy developed by the oxidation supplies apparently an explanation of this otherwise improbable reaction.

24. In pure cultures of the nitrous organism in ammoniacal solutions, the addition of carbonic acid, monosodium carbonate, or calcium acetate facilitates nitrification, the addition probably supplying carbonaceous food. Disodium carbonate greatly hinders nitrification.

25. Results obtained in 1880-81 revealed the existence of an organism which energetically converted nitrites into nitrates, but was apparently unable to oxidize ammonia.

26. In 1886 and 1890, attempts were made to separate the active organism from the 1881 cultures by growth on gelatin and potato; none of the organisms thus separated had any power of oxidizing ammonia or nitrite.

27. Recent results show that the nitric organism develops in inorganic solutions, and energetically converts nitrites into nitrates, especially if supercarbonates are present. Monosodium carbonate, 1-4 grams per litre, exerted a favourable influence, 6 grams a retarding influence. Disodium carbonate greatly hinders its action.

28. The nitric organism produces neither nitrites nor nitrates in ammoniacal solutions, even when carbonic acid, monosodium carbonate, or calcium acetate is supplied.

29. The presence of ammonia is apparently a hindrance to the action of the nitric organisms on nitrites, even when monosodium carbonate is present.

30. The dislike of the nitric organism for ammonia explains the course of nitrification when comparatively strong solutions of ammonium salt (1 gram per litre) are seeded with a small quantity of soil; much nitrous acid is then produced, and the formation of nitric acid sets in only when the ammonia has greatly diminished in quantity.

31. An attempt to isolate the nitric organism by the dilution method failed, but apparently only one other organism, a stout bacillus, growing on gelatin, was present in some of the cultures. The stained preparations from these cultures contained an abundance of the minute circular organisms observed in pure cultures of the nitrous organism; the form of the two organisms is thus apparently similar.

32. The nitrification effected by soil is thus explained as performed by two organisms, one of which oxidizes ammonia to nitrites, while the other oxidizes nitrites to nitrates. The first organism is easily separated from the second by successive cultivations in solution of ammonium carbonate. The second is (probably) separated as easily from the first by successive cultivations in solution of potassium nitrite containing monosodium carbonate.

33. In soil, the nitric organism is as active as the nitrous, since soil never contains any but extremely weak solutions of ammonia, and supercarbonates are always present.

Citric Acid as a Normal Constituent of Milk. T. Henkel. (*Landw. Versuchs-Stat.*, xxxix. 143-151.) The author's experiments show that citric acid occurring in milk is not a product of change or an accidental impurity, but that it must be considered a normal constituent of this liquid.

Artificial Human Milk. T. M. Clague. (*Pharm. Journ.*, 3rd series, xxii. 651.) The author suggests the following working formula as yielding a product more closely in accord with human milk than that obtained by the mode advocated by Frankland, while the process is simpler and more economical.

New Milk	.	.	.	.	.	.	30 oz.
Cream	.	.	.	.	.	.	1 $\frac{3}{4}$ „
Milk Sugar	.	.	.	.	.	.	1 $\frac{1}{2}$ „
Water	.	.	.	.	.	.	18 „

The product has the following composition :—

Casein	.	.	.	.	.	.	2.7 per cent.
Butter	.	.	.	.	.	.	3.8 „
Milk Sugar	.	.	.	.	.	.	5.0 „
Salts	.	.	.	.	.	.	.4 „

For the purpose of sterilization the author recommends Soxhlet's process (*Pharm. Journ.*, 3rd series, vol. xvii. 573) with slight modifications. The following is given as a kitchen recipe for the production of sterilized artificial human milk :—

New Milk	.	.	.	.	.	.	3 pints.
Cream	.	.	.	.	.	.	4 oz.
Milk Sugar	.	.	.	.	.	.	3 $\frac{1}{2}$ oz.
Water	.	.	.	.	.	.	2 pints.

Dissolve the milk sugar in the water, and mix all together. Put into bottles filled to the shoulder only, place them on the tray of a fish kettle, surround with water, and place on the fire. Allow the water to boil for half an hour, so that the expansion of the milk may be fairly complete; then cork, and allow the boiling to continue for another half-hour, when the operation is complete.

A sample of the kitchen-prepared article submitted to analysis gave the following results :—

Casein	.	.	.	.	.	.	2.6 per cent.
Butter	.	.	.	.	.	.	3.4 „
Milk Sugar	.	.	.	.	.	.	4.8 „
Ash	.	.	.	.	.	.	.4 „

The product was found to be as digestible as human milk and much more so than cow's milk.

Non-Elimination of Alcohol by the Milk. F. Klingemann. (*Virchow's Archiv*, cxxvi. 72-80.) The author reports that after the administration of large doses of alcoholic liquors to nursing women, no alcohol could ever be found in the milk. Mere traces of it were detected in the milk of animals after very excessive doses.

Action of Heat on Milk. A. R. Leeds and E. P. Davis; also Dr. Blackader. (*Amer. Journ. Pharm.*, September, 1891, March, 1892.) The changes which milk undergoes in the sterilization process are summarized as follows:—

1. The starch liquefying ferment which exists in cow's milk in minute quantities is destroyed when the heat rises above 165° F.

2. A portion of the lactalbumen is coagulated.

3. The casein, after the action of prolonged heat, is less rapidly coagulated by rennet, and yields slowly and imperfectly to the action of pepsin and pancreatin.

4. The fat globules are injuriously affected by the heat. The fat is free to some extent, and after standing, small lumps of butter are sometimes observed on the surface of the milk, while the portion not freed has a decidedly lessened tendency to coalesce. When sterilized and unsterilized milk are churned, it is found that the unsterilized yields more butter and in less time.

5. Milk sugar is more or less completely destroyed on boiling.

It would appear, therefore, that sterilized milk is less readily and less perfectly digestible than raw milk. Yet it is to be generally preferred to raw milk swarming with bacteria. By its use in the large cities the destruction of infant lives and the frequency of summer diarrhoea is materially decreased. In the country, or where fresh milk can be procured, the process of sterilizing is to be avoided. Wherever sterilization is required, care should be taken to avoid too high a temperature. For ordinary purposes it suffices to render the milk feebly alkaline with lime water, and to heat it to 155° F. and maintain it at that temperature for six minutes. A somewhat superior process consists in the treatment of the slightly alkaline milk with pancreatin at 155° F., followed, if the milk be not immediately wanted, by momentary heating to the boiling point. Either of these procedures is stated to render milk sterile without detracting from its digestibility.

The Proteids of Milk. J. Sebelien. (*Journ. Physiol.*, xii. 95-96.) The author's statement that milk contains a globulin has been called in question by Halliburton. He has now repeated his experiments and re-affirms his previous statement on this point.

Bases obtained from Casein. E. Drechsel. (*Chem. Centr.*, 1891, ii. 712.) The author has previously described two bases obtained by him as decomposition products of casein (abstract, *Year-Book of Pharmacy*, 1890, 76). He now reports that both these products correspond to the formula $C_6H_{14}N_2O_2$, and that they are identical. The base is found to be isomeric with diamidocaproic acid. It combines with one and with two molecules of hydrochloric acid, forming a neutral and an acid hydrochlorate.

Peptotoxine. E. Salkowski. (*Virchow's Archiv*, cxxiv. 409-454.) The author has repeated Brieger's experiments respecting the formation of a toxine in the digestion of fibrin by means of pepsin. His results do not confirm those of Brieger. He finds the digestion of proteids by pepsin to proceed without the formation of a poisonous base soluble in water and amyl alcohol like Brieger's peptotoxine. In the case of putrid fibrin, or a fresh meat exposed for too long a period to the action of the pepsin, poisonous bases were found; but in the latter case the occurrence of such bases was the result of putrefaction, while in the former it could be proved that the bases pre-existed in the putrid fibrin before the experiments were commenced. The undoubtedly poisonous effect of peptones and albumoses is regarded by the author as an inherent property of these bodies, and not as due to any basic product or toxine separable from them.

Choline and Neurine. E. Schmidt. (*Archiv der Pharm.*, cxxix. 467-486.) In order to convert choline into neurine, it is heated with fuming hydriodic acid at 140° , and the product is treated with moist silver oxide. To convert neurine into choline, it is heated with hydriodic acid, and the product then heated with silver nitrate in aqueous solution. An aqueous solution of choline, either strong or weak, may be kept for months without any conversion into neurine taking place.

Contrary to Gram, the author finds that choline platinochloride is not converted into neurine platinochloride when heated with hydrochloric acid in the water-bath. He also contradicts the statement that choline lactate is converted into neurine lactate when heated in water, and shows that a *lactocholine platinochloride* is formed under these conditions.

Artificial Melanin. G. Pouchet. (*Comptes Rendus*, cxii. 884-885. From *Journ. Chem. Soc.*) A substance having the general properties of the melanins is found in old anatomical preparations preserved in alcohol, and is also obtained by treating fresh blood with alcohol and mercuric chloride; the exact conditions which

determine its formation have not yet been ascertained. It forms black grains insoluble in alcohol, ether, carbon bisulphide, and hydrochloric acid. Since all other constituents of blood are soluble in hydrochloric acid, the melanin can easily be separated from them. The grains dissolve in a 2 per cent. solution of potash, but a flocculent, brownish substance is precipitated on addition of hydrochloric acid; they dissolve in sulphuric acid, forming a reddish solution, or if the acid is slightly diluted, a ponceau-coloured solution. Hydrogen peroxide or chlorine-water bleaches the grains, and they are then seen to have a radiating structure. In contact with hydrochloric acid and potassium ferrocyanide, they give no blue coloration.

Influence of Oxygen on the Formation of Ptomaines. W. Hunter. (*Proc. Roy. Soc.*, xlix. 376-379.) The author records a number of experiments, the chief results of which tend to show that the formation of ordinary putrefaction ptomaines is favoured by an entire absence of oxygen.

The Diastatic Action of Saliva. A. Schlesinger. (*Virchow's Archiv*, cxxv. 146-181, and 340-363; *Journ. Chem. Soc.*, December, 1891.) The diastatic activity of saliva was estimated in a number of cases of healthy and diseased persons. The smallest ferment activity was found in a case of diabetes mellitus (0.42 per cent.), and in a case of phthisis (0.45). The other cases of diabetes show a slight diminution, as do also the other cases of phthisis, typhoid, chronic nephritis, mercurial salivation, iodism, articular rheumatism, dyspepsia, cancer, and jaundice. In spinal paralysis no difference was observed. The eight normal cases showed only slight differences; the greatest difference being 0.097 (0.878 and 0.781). In young children the ferment activity is rather less than in adults.

The addition of an alcoholic solution of thymol for antiseptic purposes lessened the diastatic activity in one-half of the normal, and one-third of the pathological cases; in the remaining two-thirds it did not; the hindering influence is believed to be due both to the thymol and the alcohol, chiefly on the bacteria in the saliva, which appear to be more abundant in pathological than in healthy saliva. A very complete history of the subject and bibliography are given.

Influence of Temperature on Digestive Ferments. E. Biernacki. (*Zeit. Biol.*, xxviii. 49-71. From *Journ. Chem. Soc.*) Digestive ferments require for their efficient action a certain reaction and a suitable temperature. The *optimum* temperature

is 39–40°, that is, a little over that of the body. Higher temperatures destroy the ferment, and the present research is occupied with the determination of the temperature necessary for this latter purpose.

The first ferment investigated was trypsin, and it was found that 45° C. markedly lessens its activity, and exposure for five minutes to 50° destroys it altogether. Some of the specimens of trypsin employed were pure, others impure, and certain exceptions to the above stated rule were noted. It being very improbable that various tryptins differ in this particular, in virtue of their inherent characters, experiments were instituted to determine the factor that caused the difference. It was found that small admixtures with certain salts had the power of increasing the resistance of the ferment to temperature; the activity of the ferment was often lessened by the salt (although this was more marked in the case of pepsin), but the *optimum* temperature was 50°; 55° lessened, and 60° destroyed, the activity of the ferment. The salts which acted thus were ammonium sulphate (a salt used in the preparation of some specimens of ferment used in the preliminary experiments), ammonium chloride, phosphate, and nitrate, and sodium chloride. If mixtures of two or more of these salts were used, the effect was more marked still.

Certain salts (ammonium carbonate and oxalate, magnesium sulphate, sodium sulphate and phosphate), starch, and sugar had no such action, but certain products of proteolytic activity (albumose, amphopeptone, and antipeptone) act like the salts just enumerated. All the materials that act in this way increase the alkalinity of the digesting medium; minute doses of sodium hydrate act in a precisely similar way, and the proposition is advanced that the whole of the phenomena are simply dependent on the reaction. Increase of alkalinity protects the ferment. It was found that increase of acidity (trypsin will act in an acid medium if salicylic acid be employed) acts in exactly the opposite way; in an acid medium, 33–35° is the *optimum* temperature; 40° hinders, and 45° destroys, the action of the ferment.

Pepsin was then investigated, and it was found that acidity acts towards this ferment precisely like alkalinity towards the tryptic ferment, the temperature necessary to destroy its activity rising from 65° to 70°. In a neutral medium the temperature falls to 55°.

Unfiltered fresh saliva loses its diastatic properties at 75°, filtered saliva at 70°, diluted saliva at 60°, pure ptyalin at 70°, unless its

solution is much diluted, when the necessary temperature sinks to 60°. The influence of salts, reaction, etc., is exactly the same in kind as with trypsin. In all cases, if the pure ferment be used, the influence of temperature and the influence of salts, etc., on the temperature are more easily observed than if the ferment be impure, as contained, for instance, in the digestive juice.

The explanation of these occurrences probably lies in the formation of loose compounds with the enzymes, analogous to the pepsin-hydrochloric acid of Schmidt and other authors.

Influence of Menthol on the Gastric Functions. N. A. Vladimirsky. (*St. Petersburg Inaugural Dissertation*, 1891, No. 77, p. 44; *Medical Chronicle*, August, p. 367.) Following I. T. Tchüdnovsky's suggestion, the author has carried out a set of experiments on seven healthy subjects (six men, including himself, and one woman), aged from 24 to 32, the drug being administered with food, in the dose of 0.3, 1.0, and 2.0 grams. He arrives at the following conclusions:—

1. The drug (in any of the doses stated) very markedly diminishes the proportion of free hydrochloric acid in the gastric juice, the decrease attaining its maximum in about 1 or 1½ hours after the ingestion.

2. In persons presenting a more or less weakened motor power of the stomach, the decrease lasts longer than in those with a normal one.

3. The digestive power of the gastric juice is diminished.

4. The transformation of proteids into peptones is retarded (hence an increased proportion of propeptones, *i.e.*, intermediary products of peptonisation).

5. The proportion of lactic acid in the gastric juice is augmented, the rise keeping parallel with the diminution in the proportion of free hydrochloric acid.

6. The motor power of the stomach grows weaker (in about one hour after the ingestion); in initial stages of the digestion, however, it may occasionally undergo some increase.

7. The absorptive power of the organ improves, which seems to be dependent upon a favourable (stimulating) influence of menthol on the circulation.

8. Contrary to the statements of Ossendowski, L. Braddon, M. Reichert, S. Rosenberg, Hugo Koster, and many other observers, menthol does not appear to possess any special "appetite-making" power.

9. In 1 and 2 gram doses, the remedy gives rise to a kind of

intoxication, followed, in 4 or 5 hours, by sensations of languor and drowsiness.

10. Menthol may prove useful as a substitute for camphor.

Crystalline Egg Albumen. S. Gabriel. (*Zeitschr. für physiol. Chem.*, xv. 456-464.) In preparing this substance in accordance with Hofmeister's directions, the author found that a half-saturated solution of ammonium sulphate was too strong to avoid precipitation. He therefore prefers to dissolve the albumen in water, then to add a saturated solution of ammonium sulphate until the mixture begins to appear cloudy, and finally to clear it again by the addition of a little more water. The formation of all stages of crystallization can then be easily observed. The product has the following composition:—

Egg Albumen	80.86 per cent.
Ammonium Sulphate	15.56 " "
Water	3.39 " "
Ash	0.19 " "

Crystalline Egg Albumen. F. Hofmeister. (*Zeitschr. für physiol. Chem.*, xvi. 187-191.) The author finds that crystalline albumen, if carefully washed till all the ammonium sulphate has been removed, leaves practically no ash upon incineration. The percentage composition of the crystals is as follows:—

C =	53.28.
H =	7.26.
N =	15.00.
S =	1.09.
O =	23.37.

Harnack's Ash-free Albumen. B. Werigo. (*Pflüger's Archiv*, xlviii. 127-149.) The author arrives at the conclusion that Harnack's preparation is only a derivative of albumen, resembling in its properties the well-known derivatives called acid-albumen and alkali-albumen. It is not coagulated by heat, but is precipitated by neutralisation, the precipitate being soluble in excess of either acid or alkali.

Albumone, a New Proteid from Human Blood. C. Chabrié. (*Comptes Rendus*, cxiii. 557.) Albumone is a new proteid isolated by the author from blood by neutralising the serum with acetic acid, coagulating and evaporating at 100° C., extracting the residue with hot distilled water, and precipitating the solution with alcohol. Albumone is not coagulated by heat or acetic acid, and has no saccharifying action on starch; its solution is

precipitated by phosphotungstic acid, mercuric nitrate, Millon's reagent, and by sodium sulphate, also by ammonium phosphomolybdate on heating; the precipitate with nitric acid is readily soluble in excess, and the acetic acid solution is rendered turbid by potassium ferrocyanide.

The Alkalinity of the Blood. H. Winternitz. (*Zeitschr. für physiol. Chem.*, xv. 505-512.) The author determines the alkalinity of the blood by titration with decinormal solution of tartaric acid, litmus paper being used as an indicator. The best results are obtained by working upon small quantities of blood only. The alkalinity of blood decreases on standing; but if the blood be immediately neutralised, no further change in the reaction occurs. The oxygen present does not appear to influence the result.

The mean alkalinity of 100 c.c. of normal rabbit's blood was found by the author to be equivalent to 0.165 gram.

Tuberculin. W. Hunter. (*Brit. Med. Journ.*, ii. 1891, 169-176.) Koch's tuberculin was subjected to approximate analysis with the following results. In order of importance and amount the substances present are:—

(1) Albumoses: chiefly proto-albumose and deutero-albumose, along with hetero-albumose, and occasionally a trace of dysalbumose. (2) Alkaloidal substances, two of which can be obtained in the form of platinochlorides. (3) Extractives, small in quantity and of unrecognised nature. (4) Mucin. (5) Inorganic salts. (6) Glycerol and colouring matter. Serum albumen, globulin, and peptone are absent.

With regard to its action, the following conclusions are drawn:—

1. Tuberculin owes its activity to at least three, and probably more, different substances.

2. Its remedial and inflammatory actions are connected with the presence of certain of its albumoses, whilst its fever-producing properties are chiefly associated with substances of a non-albuminous nature.

3. The albumoses are not lost by dialysis; the latter are. It is thus possible to remove the substances which produce fever, while retaining those which are beneficial in their action. The fever is thus not essential to its remedial action, and the same may probably be said for the inflammation, although, under certain conditions, inflammation appears to be beneficial.

4. The remedial action consists in shrinking of the tuberculous tissues, and increased scaling, due to deep local congestions.

5. The remedial substance resists high temperatures. Its action is, however, lessened by a dry heat of 70° . Its properties are materially altered by changes occurring during its purification by dialysis, and thus its preparation is attended with difficulty.

6. The remedial substance and the other albumoses present are stated to belong to the class of "proteins," that is, albuminous substances derived from the protoplasm of the bacilli themselves, and not merely formed by the action of these bacilli on the surrounding tissues.

Various modifications of tuberculin were prepared, and lettered as follows:—

Modification A contains the total precipitate thrown down by absolute alcohol; it thus contains chiefly albumoses.

Modification C contains all the constituents of tuberculin not present in A.

Modification B contains the whole of the albumoses precipitated by the use of ammonium sulphate, the salt being subsequently removed by dialysis.

Modification CB was prepared from C, and contains the small amount of albumose which was not thrown down by the first precipitation with absolute alcohol. Salts were got rid of by dialysis. This modification, when tested in cases of lupus, produced distinct local improvement, unattended with fever, and very little inflammatory action.

A Convenient Method for Estimating the Specific Gravity of Blood. J. B. Haycraft. (*Proc. Roy. Soc. Edin.*, xviii. 251-254.) Two mixtures of benzyl chloride (sp. gr. 1.100) and toluene (sp. gr. 0.8706) are made, one having a sp. gr. of 1.070 and the other of 1.020. One c.c. of the solution of higher gravity is measured in a pipette graduated to 0.01 c.c., and run into a glass tube containing a drop of the blood, which will at once rise to the surface. The lower gravity solution is now slowly added from a similar pipette until the globules of blood show no tendency either to rise or to sink. At this point the specific gravity of the mixture is equal to that of the blood, and is readily found by calculation from the relative proportion of the two liquids used. A correction of 0.44 specific gravity is made for every degree of temperature above 60° F.

Influence of Acids and Alkalies on the Alkalinity of Human Blood, and on the Reaction of the Urine. A. Freudberg. (*Virchow's Archiv*, cxv. 566-600.) The result of a number of observations on the blood and urine of patients suffering from

a variety of diseases, and also after the administration internally of various acids and alkalies, are given in tabular form, from which the following general conclusions are drawn :—

Hydrochloric acid (4–8 grs. of the officinal acid *per diem*) does not alter the alkalinity of the blood. Only one exception was noted. The acidity of the urine is, however, always increased.

Lactic acid (10–30 grs.) lessens the alkalinity of the blood by one-fifth to one-fourth. The acidity of the urine is increased, but not markedly so, and not in a degree corresponding with the amount of acid given. It is no doubt to a large extent oxidized in the body.

Tartaric acid (5–10 grs.) lessens the alkalinity of the blood by one-sixth; it also increases the acidity of the urine, but not markedly. It is also burnt to a great extent in the body.

Sodium bicarbonate (5–15 grs.) in three cases increased the alkalinity of the blood by one-fourth; in two other cases there was no change. In all cases the urine was strongly alkaline.

The Action of Cocaine on Blood Constituents. E. Maurel. (*Amer. Journ. Pharm.*, May, 1892.) The author states that in doses which do not affect the blood-corpuscles, the leucocytes are killed. This effect is produced by 0·10 to 0·20 gram of the salt for 100 grams of blood, equal to about 1 kilo. of body-weight. About 0·05 gram of the salt causes changes in the leucocytes, but their vitality is not destroyed. Doses of 0·05 to 0·10 gram of cocaine hydrochloride, repeatedly administered, are sufficient for killing the leucocytes of from 50 to 75 grams of blood. The death of the leucocytes may account for some of the accidents which appear after such injections.

Hæmocyanin, the Blue Colouring Matter in the Blood of Crustaceæ. A. B. Griffiths (*Comptes Rendus*, cxiv. 496); also F. Heim (*Comptes Rendus*, cxiv. 771). This colouring matter may be obtained from the blood of *Homarus*, *Sepia*, or *Cancer* by precipitating with magnesium sulphate, dissolving the precipitate in water, reprecipitating by alcohol, and drying first at 60° C. and afterwards in a vacuum. It appears to be more stable than hæmoglobin. Griffiths gives the formula as $C_{867}H_{1363}N_{223}CuS_4O_{258}$; but Heim does not consider copper as one of its essential constituents. He found it present in the lobster, but absent in the crab, crayfish, etc.

Hæmocyanin is found to exist in two states, viz. colourless and coloured, or in other words, reduced and oxidized. The oxygen

compound is destroyed by reducing agents, and also by exposure in a vacuum.

Composition of the Blood in Leucæmia. E. Freund and F. Obermayer. (*Zeitschr. für physiol. Chem.*, xv. 310-318.) The blood of leucæmic patients contains a low percentage of solids and a high percentage of fatty matters, and is characterized by the presence of peptone. In one instance, the number of red blood corpuscles, compared with the white ones, was in the relative proportion of 1,000,000 to 945,000. The amount of hæmoglobin was only about one-fourth of that normally occurring in healthy blood.

Erection of Iron from the Organism. R. Gottlieb. (*Zeitschr. für physiol. Chem.*, xv. 371-386.) The author's experiments were made with the double tartrate of iron and sodium, which was administered hypodermically. Nearly the whole of the iron was found to pass into the intestinal canal. After protracted injections, the greatest part of the metal left in the body was found in the liver. The author does not think that the iron is carried from the liver to the intestine by the bile, but that it finds its way there by the circulating blood, from which it is removed from the blood by the intestinal epithelium, and excreted into the intestine.

Lactic Acid and Glucose in Hydrocyanic Acid Poisoning. H. Zillessen. (*Zeitschr. für physiol. Chem.*, xv. 404.) The author finds that in cases of poisoning by hydrocyanic acid, lactic acid passes into the blood, diminishing its normal alkalinity. At the same time there is an increase of sugar in the blood.

Excretion of Uric Acid and Urea. W. P. Herringham and H. O. Davies. (*Journ. Physiol.*, xii. 475-477.) The authors' experiments were undertaken with the object of checking Haig's statement that the proportion of uric acid to urea varies inversely with the daily total acidity of the urine. They find that the proportion of uric acid to urea varies, but that it bears no fixed relation to the total acidity of the urine.

Homogentisic Acid and Alcaptonuria. M. Wolkow and E. Baumann. (*Zeitschr. für physiol. Chem.*, xv. 228, and xvi. 268-270.) The term alcapton was originally used by Bödeker for a nitrogenous reducing substance occurring in certain urines, which become brown on the addition of an alkali in the presence of oxygen. Fürbringer first advanced the theory that alcapton was not nitrogenous, but was identical with catechol. W. Smith showed, however, that in one case protocatechuic acid, and not

catechol, was the subject in question, and Kirk has in another series of cases described a new acid which he terms uroleucic acid. Marshall has more recently described a similar acid as glycosuric acid.

The authors have separated the acid in question from the urine after concentration by rendering it strongly acid and shaking with ether. From the ethereal solution, it was obtained by evaporating off the ether, taking up with water, and precipitating by lead acetate; the lead was removed from the precipitate by hydrogen sulphide. The acid was once more extracted with ether, which on evaporation yielded crystals. These consisted of a substance very similar to, but not identical with, Kirk's uroleucic acid, and the name *homogentisic acid* is given to it. Analyses of the dried crystals correspond very well with the formula $C_8H_8O_4$. It reduces alkaline cupric salts and silver salts readily, but bismuth salts with great difficulty. With Millon's reagent, it gives a yellow coloration which turns red on boiling. It is monobasic, and contains two phenolic hydroxyl groups, but it is not identical with any of the hitherto described acids with the same formula. It melts at $146.5-147^\circ$.

The authors arrive at the conclusion that homogentisic acid is quinol, in which one hydrogen atom is replaced by an acetic acid residue. Kirk's uroleucic acid is regarded by them as trihydroxyphenylpropionic acid.

The following method for the estimation of homogentisic acid in urine is recommended:—10 c.c. of the urine is mixed in a flask with 10 c.c. of 3 per cent. ammonia; this is then titrated with decinormal silver nitrate solution; the mixture, after the addition of 5 drops of calcium chloride solution, and 10 drops of ammonium carbonate solution, is filtered, and the filtrate tested with silver nitrate; if any reduction occurs, another quantity of urine is similarly treated, only more standard silver solution is employed. This is repeated as often as necessary, excess of silver being recognised by hydrochloric acid. 1 c.c. of the silver solution corresponds with 0.004124 gram of homogentisic acid.

Derivatives of Salol in Urine. M. Lacroix. (*Bull. Gén. de Therap.*, 1891, cxx. 284.) The author calls attention to the fact that the urine of patients undergoing treatment with salol reduces Fehling's solution and bismuth salts in a similar manner as glucose. For the purpose of distinguishing such urine from diabetic urine, and of recognising glucose in the simultaneous presence of salol derivatives, he suggests the following process:—100 c.c. of

the urine to be tested are shaken with 1 gram of sulphuric acid and about 50 c.c. of pure ether; it is then permitted to separate. The upper layer, containing the derivatives of salol, is evaporated, the residue dissolved in water, and a few drops of perchloride of iron are added to it. This would give rise to a violet colour in case salol were present. The lower layer, after separation from the ethereal solution, is treated with subacetate of lead, filtered, and the glucose then estimated in the usual manner.

Sugar in Blood. J. Seegen. (*Centr. Physiol.*, v. 821-826, 869-872.) Lépine has attributed the rapid disappearance of sugar from blood to the presence of a ferment, and has stated that when this ferment ceases to exist in the blood in an active state, diabetes is produced (abstract, *Year-Book of Pharmacy*, 1891, 111). The author has re-investigated this subject, and has arrived at the conclusion that the ferment in question does not exist in the circulation, but is formed by *post-mortem* changes in the blood.

Glycolysis in Blood. M. Arthus. (*Comptes Rendus*, cxiv. 605-608.) The author arrives at the conclusion that glycolysis in blood is a phenomenon of chemical fermentation and is not due to the development of micro-organisms. The glycolytic ferment does not pre-exist in the blood, but is formed after the latter is removed from the blood-vessels.

The Behaviour of Milk-Sugar in Diabetes. F. Voit. (*Zeit. Biol.*, xxviii. 353-360; *Journ. Chem. Soc.*, July, 1892.) A diabetic patient was taking strict diet, and the amount of sugar in the urine reduced to a low ebb. On one occasion 100 grams, on another 150 grams, of milk-sugar were administered; the sugar in the urine at once went up. A pure culture of *Saccharomyces apiculatus* was added to the urine, and fermentation allowed to go on. After a few days' fermentation, the urine contained no sugar. This fungus causes the alcoholic fermentation of glucose, but not of lactose. Thus there was no lactose in the urine. The dose given was not large enough to cause the appearance of this sugar in the urine. The explanation given of what had occurred is the following:—Before the sugar was given, the small amount of diabetic sugar in the urine must have originated from proteid metabolism. Lactose appears in the urine more readily than any other form of sugar, not because it is burnt in the organism with greater difficulty, but as it is a form of sugar from which it is not possible for the liver to make glycogen, its "assimilation limit" is low, and so passes unused into the urine. In diabetics it appears to be

more readily burnt in the body than dextrose, and takes the place of some of the dextrose originating from proteïd metabolism. Hence, when lactose is given, a large quantity of dextrose remains unburnt, and passes as such into the urine.

Hæmatoporphyrin in Urine. W. D. Halliburton. (*Proc. Physiol. Soc.*, 1891, 21.) The author confirms the occurrence of this pigment after the prolonged administration of sulphonal (see also abstract, *Year-Book of Pharmacy*, 1891, 116). He found it in the urine of a woman suffering from melancholia, who had been taking sulphonal for five months.

Hæmatoporphyrin in Urine. O. Hammarsten. (*Skand. Archiv für Physiol.*, iii. 319-343.) The author reports upon four cases in which this pigment occurred in the urine and could be isolated from it. In all these cases the patients were undergoing treatment with sulphonal. In the author's opinion, further observations are necessary to justify the conclusion that the administration of this drug is the direct cause of the formation of the pigment.

A Sensitive Test for Albumen in Urine. E. Spiegler. (*Oesterr. Zeitschr. für Pharm.*, 1892, 65.) The reagent employed by the author is made by dissolving 8 grams of mercuric chloride, 4 grams of tartaric acid, and 20 grams of sugar in 200 grams of water. The sugar is merely added with the object of increasing the density of the solution. In applying the test, the urine is acidified with a few drops of strong acetic acid, filtered if necessary, and cautiously dropped from a pipette into a test-tube half filled with the reagent in such a manner that the two liquids do not mix; the presence of albumen is then indicated by the formation of a white ring at the point of contact of the two liquids. Urines which are slightly turbid through bacteria need not be clarified. Peptone does not give this reaction, but propeptone (hæmialbumose) does.

By means of this test 1 part of albumen in 150 parts of urine is stated to be easily detected, and with due care, even as little as 1 part in 225,000 should not escape observation.

Detection of Albumen in Urine containing Bile. P. Crocco. (*Répertoire de Pharm.*, 1892, 168.) The author states that urine containing bile pigments, particularly biliverdin, when tested for albumen by the ordinary methods, is liable to give the reaction though albumen may be entirely absent. The precipitate obtained under such circumstances by mineral acids, or by heat in the presence of acetic acid, is stated to consist of bile compounds,

and to be soluble in alcohol; it does not give the biuret reaction. To avoid error, it is recommended to mix the urine with 3 per cent. of concentrated uric acid, to allow the mixture to stand cold for a few hours, and then to filter it, before applying the usual tests.

Detection and Estimation of Santonin in Urine. M. H. Manseau. (*Chem. Centr.*, 1891, ii. 733.) The urine is evaporated to a syrup, treated with chloroform, the extract filtered, concentrated at a low temperature, and to the residue are added four or five drops of soda solution, together with a little alcohol. In the presence of santonin, a brick-red or blood-red coloration is formed when this solution is evaporated. The process is recommended for the detection of santonin in cases of poisoning.

Detection of Quinine and Phenacetin in Urine. F. Sestini and R. Campani. (*L'Orosi*, xiv. 304-306. From *Journ. Chem. Soc.*) From medico-legal investigations conducted by the authors they have arrived at the following conclusions:—The presence of phenacetin conceals the fluorescence of sulphuric acid solutions of the cinchona alkaloids, especially when dilute. Aqueous solutions of phenacetin are coloured violet-yellow on the addition of chlorine-water and ammonia, but mixtures of quinine and phenacetin are coloured light-blue (methylene blue). Solutions of quinine acquire the characteristic green colour on treatment with bromine vapour and a few drops of ammonia, even in presence of phenacetin, but no reaction is obtained if the solution is strongly acid. Very dilute solutions of quinine are coloured yellow by bromine vapour alone, even in presence of phenacetin; concentrated solutions give, with excess of bromine vapour or with bromine-water, a yellow precipitate which disappears on adding ammonia, without any green coloration being produced.

To obtain the green coloration of quinine salts with bromine, it is best to agitate the solution with bromine vapour until it becomes slightly turbid, and then add ammonia drop by drop; if there is much phenacetin present, the green coloration will be darker and have a violet tinge. On shaking it with ether, and allowing it to remain for a time, the lower layer assumes the emerald-green colour due to quinine, and the upper layer the violet-yellow of the phenacetin.

To detect quinine in the ethereal residues from urine or viscera examined by the Stas-Otto method, they are treated with ether, and the solution divided into two parts; to one of these, bromine vapour is added until a yellow precipitate begins to form, and

then, on adding ammonia, the green colour slowly appears at the bottom of the tube. To the other portion, a saturated solution of bromine-water is added until the yellow precipitate of bromo-quinine is thrown down, and this should be readily redissolved by ammonia.

Estimation of Sugars by means of Copper Potassium Carbonate Solution. H. Ost. (*Ber. der deutsch. chem. Ges.*, xxiv. 1634-1636.) The author has extended his previous experiments (see *Year-Book of Pharmacy*, 1891, p. 121) to the estimation of maltose. His results are embodied in the following table:—

Copper.	Maltose hydrate.	Maltose anhydrous.	Copper.	Maltose hydrate.	Maltose anhydrous.
50	30.6	29.1	180	107.7	102.3
55	33.6	31.9	185	110.8	105.3
60	36.5	34.7	190	114.0	108.3
65	39.4	37.5	195	117.1	111.3
70	41.4	39.3	200	120.3	114.3
75	45.3	43.1	205	123.5	117.3
80	48.3	45.9	210	126.7	120.3
85	51.2	48.6	215	129.9	123.3
90	54.1	51.4	220	133.1	126.4
95	57.0	54.2	225	136.4	129.6
100	59.9	57.0	230	139.8	132.8
105	62.9	59.8	235	143.2	136.0
110	65.8	62.6	240	146.7	139.3
115	68.8	65.4	245	150.2	142.6
120	71.7	68.2	250	153.7	146.0
125	74.6	71.0	255	157.3	149.4
130	77.6	73.8	260	161.0	152.9
135	80.6	76.6	265	164.8	156.6
140	83.6	79.4	270	168.7	160.3
145	86.5	82.2	275	172.7	164.1
150	89.5	85.0	280	176.7	167.9
155	92.5	87.9	285	180.7	171.7
160	95.5	90.7	290	184.9	175.7
165	98.5	93.6	295	189.5	180.0
170	101.5	95.5	298.6	195.0	185.2
175	104.6	99.4			

The maltose solutions were boiled for ten minutes before collecting the cuprous oxide.

The Estimation of Sugars by means of Phenylhydrazine. L. Maquenne. (*Comptes Rendus*, cxii. 799-802. From *Journ. Chem. Soc.*) The weight of the osazones precipitated when different reducing sugars are heated for the same time with the same weight of phenylhydrazine varies considerably with the nature of the sugar, but remains constant for the same sugar so long as the

conditions are precisely the same. The following results were obtained by heating for an hour at 100° 1 gram of each sugar with 100 c.c. of water, and 5 c.c. of a solution containing 400 grams of phenylhydrazine and 400 grams of glacial acetic acid per litre; after cooling, the precipitate was collected, washed with 100 c.c. of water, and dried at 110° :—Sorbitose, 0.82; levulose, 0.70; xylose, 0.40; glucose (anhyd.), 0.32; arabinose, 0.27; galactose, 0.23; rhamnose, 0.15; lactose, 0.11; maltose, 0.11. With more dilute solutions, the relative differences remain practically the same, but levulose tends to approach sorbitose. It is noteworthy that sorbitose and levulose yield a much greater quantity of osazone in a given time than any other sugars, and these are the only two isomerides or homologues of glucose that have a ketonic function. The two are readily distinguished, since the glucosazone forms easily recognisable needles, whilst sorbitosazone never forms distinct crystals. Glucosazone and galactosazone, which both crystallize well and melt at practically the same temperature, can be distinguished by their rate of formation. It is also noteworthy that the reducing saccharoses give less osazone than the non-hydrolysable sugars, and therefore less than the products of their own inversion.

A comparison of the weight of osazone obtained from the products of inversion of polyglucoses with the weight obtained from a known mixture of glucoses affords valuable help in determining the products of inversion of the polyglucoses. The following results were obtained with 1 gram of sugar completely inverted by dilute sulphuric acid, dissolved in 100 c.c. of water, and mixed with 2 grams of phenylhydrazine, 2 grams of glacial acetic acid, and 5 grams of sodium acetate; in each case the result is compared with that obtained with artificial mixtures of corresponding quantities of glucoses:—

	Weight of Osazone.
{ Ordinary Saccharose	0.71
{ Glucose and Levulose (0.526 gram each)	0.73
{ Maltose	0.55
{ Glucose (1.052 grams)	0.58
{ Raffinose (cryst.)	0.43
{ Levulose, Glucose, and Galactose (0.303 gram each)	0.53
{ Lactose (cryst.)	0.33
{ Glucose and Galactose (0.5 gram each)	0.39

The weight of osazone is always slightly lower in the case of the products of inversion, because of the destructive action of the

acid. This error can be compensated by diluting the solutions until equal volumes have the same reducing power. In this way it was found that the product of the inversion of melezitose gives the same weight of osazone as a solution of glucose of equal reducing power, and therefore glucose is the sole product of the inversion of melezitose.

A Simple Method of Estimating Dissolved, Fixed, and Volatile Organic Matter in Water. W. C. Young. (*Journ. Soc. Chem. Ind.*, x. 883-889.) To determine the total organic matter, 1 litre of water, to which 0.5 gram of dried and ignited sodium carbonate is added, is distilled in a conical iron still of about 2 litres capacity, attached to a tin worm-condenser. The distillate is received in a graduated measure, and when 970 c.c. has been collected, the source of heat is removed, the still disconnected, the contents and washings placed in a platinum basin, and evaporated to dryness on a water-bath. The residue is then dissolved in a little pure distilled water, filtered through an asbestos plug into a platinum basin, dried on a water-bath, and subsequently heated for an hour in an air-bath at 150°. After cooling in a desiccator, the basin and contents are weighed. The residue is then ignited at a low temperature, cooled, and weighed, and the loss noted. The ignited residue is dissolved in water, excess of sulphuric acid added, and then standard solution of potassium permanganate (1 c.c. = 0.0001 gram O), until the colour remains permanent after five minutes. The weight of oxygen lost, thus ascertained, is deducted from the loss on ignition, and the difference is the organic matter. To determine the fixed organic matter, the same course is followed, except that the sodium carbonate is not added until the concentrated water is transferred from the iron still to a platinum basin. To determine the volatile organic matter, the distillate from the last-mentioned process is placed in the still, together with 0.5 gram of sodium carbonate, and distilled until about 25 c.c. remains in the still, afterwards proceeding as before, except that it is unnecessary to ascertain the oxygen lost by ignition. The result presents about two-thirds of the total volatile organic matter present; further small quantities can be recovered from the distillate by repeating the process.

By the employment of sodium carbonate the whole of the compounds of calcium, magnesium, and iron are precipitated, and any combined ammonia in the water is volatilized. There only remains sodium chloride, alkali nitrates, and uncombined silica to

interfere with the loss on ignition being accepted as a measure of the organic matter present, and neither of these compounds being present in estimating volatile organic matter, the results may be accepted as free from objection on that account. As regards sodium chloride, the burning of the organic matter is so rapid (a few seconds suffices), and the temperature so low, that none is volatilized, or if a little is lost through excessive heating, the loss can be ascertained and due correction made. As regards alkali nitrates, provision is made in the process for ascertaining and correcting for loss of oxygen by reduction of nitrates, but it is seldom of any great importance, and has never exceeded, in ordinary drinking waters, the equivalent of 0.07 grain per gallon. The presence of nitrates assists the burning of the organic matter very materially, and in the case of very foul waters, such as sewage effluents or seriously polluted waters, which rarely contain any, the author finds it advisable to add a drop or two of solution of potassium nitrate before the final evaporation. With regard to the uncombined silica, the author has never found it present, and if it should be, he does not think the heat required to burn off the organic matter is sufficiently great to cause it to decompose the sodium carbonate.

Detection of Salicylic Acid in Presence of Salicylic Aldehyde. A. Schneegans and J. E. Geroek. (*Journ. Pharm. Els. Loth.*, November, 1891, 285.) The authors' test is based on the observation that the violet coloration produced in solutions of salicylic aldehyde by a very weak solution of ferric chloride can be removed by shaking with ether or chloroform, whereas the coloration due to salicylic acid remains. This reaction is also stated to be applicable for the detection of free salicylic acid in artificial oil of wintergreen.

Detection of Salicylic Acid in Beer and Wines. H. Elion. (*Zeitschr. für Analyt. Chem.*, xxxi.) The liquid to be tested is mixed with a little dilute sulphuric acid and repeatedly shaken with ether. The salicylic acid is then withdrawn from the ether with small quantities of water, to which a little caustic alkali is added, and the aqueous solution thus obtained is neutralized with hydrochloric acid. In presence of salicylic acid this liquid gives the well-known coloration with ferric chloride.

Determination of Citric and Malic Acid in Fruits. E. Claassen. (*Zeitschr. für Analyt. Chem.*, xxx., Part 3; *Chem. News*, October 30th, 1891.) The crushed fruits are stirred up with hot water, filtered, and the filtrate is mixed with milk of

lime in slight excess. The liquid is acidulated with hydrochloric acid, filtered, the precipitate gently heated with an excess of ammonia until the flocculent matter which is separated out has subsided. It is then filtered off, the filtrate is evaporated to dryness, and the residue is taken up with boiling water with an addition of ammonia. The precipitate of calcium citrate is filtered off on a weighed filter and washed with hot water. The filtrate and the washings are evaporated to dryness in the same manner, and thus small quantities of calcium citrate are recovered which have become dissolved. For the determination of malic acid the crushed fruit is treated with hot water, filtered, and the filtrate mixed with ammonia in slight excess. It is filtered again, the filtrate evaporated to dryness, and the residue finely pulverised is mixed with absolute alcohol containing ammonia. After standing for 24 hours it is filtered again, washed with absolute alcohol, and the filtrate precipitated with an exactly sufficient quantity of an alcoholic solution of lead acetate. The precipitate of lead malate is collected on a weighed filter which has been dried at 100° , washed with alcohol, dried at 110° , and weighed. The malic acid is found on multiplying the weight of lead malate by 0.2925.

Detection of Quinine in Presence of Phenacetin. F. Sestini and R. Campani. (*Pharm. Zeitung*, 1891, 494.) Phenacetin masks the thalleioquin reaction as well as the fluorescence of solutions of quinine. In order to detect the latter in the presence of the former, the test is modified by the authors as follows:—Bromine vapour is allowed to act upon the solution until a faint turbidity results, then ammonia is added, drop by drop; proceeding in this manner the green coloration appears, although darker and inclined towards a violet; if the test be now agitated with ether and allowed to stand a while, the ethereal layer will be coloured yellowish-violet and the aqueous layer green.

Test for Distinguishing Phenacetin from Acetanilid and Antipyrine. W. Autenrieth and O. Hinsberg. (*Archiv der Pharm.*, 1891, 456.) Phenacetin can be distinguished from acetanilid and antipyrine by the action of hot, dilute nitric acid. If the finely powdered phenacetin be covered with dilute nitric acid (containing about 10 per cent. of anhydrous acid) and heated to the boiling-point for a short time, the liquid as well as the powder assumes an intense yellow colour due to the formation of a nitro-phenacetin; acetanilid and antipyrine under the same treatment are not altered.

Test for Antipyrine. L. van Itallie. (*Apoth. Zeitung*, 1892, 28.) On heating a solution of antipyrine with nitric acid for some time, a cherry-red coloration is produced, the depth of which depends partly upon the amount of antipyrine present and partly on the strength of the nitric acid employed.

Estimation of Small Quantities of Strychnine. R. H. Davies and O. Echenstein. (*Chemist and Druggist*, March 26th, 1892.) The authors modify the chromate test in such a way as to make it applicable also for approximate quantitative estimations of traces of this alkaloid. A very weak solution of potassium bichromate in strong sulphuric acid is placed in a test-tube, and the solution of the strychnine then added to it, when the reaction can be readily observed. The colour thus produced soon disappears, giving place to a reddish-orange, which is fairly persistent. This coloration is compared with those obtained under the same conditions with exceedingly weak strychnine solutions of various but known strengths. An approximate idea of the amount of this alkaloid in the solution under examination is thus arrived at by a colorimetric process similar to Nesslerising.

Detection of Saccharin. D. Vitali. (*L'Orosi; Chem. News*, March 25th, 1892.) The author proposes three methods. The substance to be tested is mixed with three or four times its volume of slaked lime, and heated slowly to redness in a glass tube. There are obtained ammonia, calcium carbonate, and sulphate, and phenol, which condenses in small drops in the cooler parts of the tube. The three former products are recognised by the usual methods. For the detection of phenol the author proposes the following reaction:—A few crystals of potassium chlorate are cautiously placed in a few c.c. of concentrated sulphuric acid; a drop of this solution is put in a porcelain capsule, and a glass rod moistened with the above-mentioned condensed product is plunged into it. There appears a green coloration which changes to an intense blue. The second method consists in treating the isolated saccharin with concentrated sulphuric acid. Benzoic acid is formed. The third method agrees with that of Schmitt and Pinette, who heat with caustic soda. The products are ammonia, salicylic acid, and sulphuric acid.

Determination of Phenols. J. Messinger and G. Vortmann. (*Chem. News*, vol. 66, 37.) The authors propose a volumetric process depending on the formation of iodised phenols. From 2–3 grams of the phenol are dissolved in soda-lye (free from nitrite),

so that to 1 mol. of phenol at least 4 mols. of soda are present. The solution is made up to 250 or 500 c.c., and of this solution 5 or 10 c.c. accurately measured are put in a small flask heated to about 60°, and decinormal solution of iodine is added until the liquid is coloured a deep yellow by excess of iodine, when a precipitate appears on shaking. The liquid when cold is acidified with dilute sulphuric acid, the solution made up from 250-500 c.c., and the excess of iodine is determined in an aliquot part of the filtrate with a solution of sodium thiosulphate standardized to the decinormal solution of iodine. The proportion of phenol is determined from the proportion given below and the iodine consumed.

Consumption of I.		Colour of Precipitate.	
1 mol. Phenol,	6 atoms I. . . .	scarlet.	
1 „ Thymol,	4 „	brownish red.	
1 „ β -naphthol,	3 „	dirty green.	
1 „ Salicylic Acid,	6 „	red.	

Tests for Impurities in Commercial Creasote. E. Merklen. (*L'Union Pharm.*, 1892, 5; *Amer. Journ. Pharm.*, April, 1892.) The author gives easily applied tests for the valuation of beech-wood creasote. (1) *Water*, of which it can take up 9 per cent. Ten c.c. of creasote are heated with about 2 grams of calcium chloride in a test-tube until the salt melts. The two are then well mixed and set aside to cool. If water be present the calcium chloride remains liquid. Anhydrous copper sulphate could be used for the same purpose, the white salt becoming blue in presence of water. (2) *Phenol*. The well-known tests of collodion and perchloride of iron are of no use in case a mixture of phenol and creasote is to be examined. The best test is that proposed by Flückiger. Four c.c. of creasote and 1 c.c. of ammonia are heated to 60° C. (150° F.), well mixed, and poured into a large capsule. This is then tilted from side to side so as to make the liquid cover as large a surface as possible. A small vial of bromine is then inclined towards the centre of the capsule, so that the vapour can readily come in contact with the liquid. Where the vapour of bromine acts on phenol or carbolic acid, a deep blue colour appears in place of the brown colour turning to green, which is due to pure creasote. (3) *Guaiacol*. Although it is not proved that guaiacol is the only remedial agent contained in beech-wood creasote, it is present in large quantity, and should only traces be found it can easily be supposed that the guaiacol has been separated. In mixing 5 c.c. of creasote with 50 c.c. of a 20 per cent.

alcoholic solution of potassium hydrate, the liquid assumes, in from ten to thirty minutes, a crystalline state due to a combination of creasol and guaiacol with potassium. The crystalline mass is pressed between filter paper until perfectly dry, and put into a test-tube with 5 c.c. of sulphuric acid diluted to 1-10. The mixture is heated for a moment, when the creasol and guaiacol rise to the top of the liquid. The aqueous liquid is then sufficiently diluted to allow the oils to sink to the bottom, when it is decanted, and is replaced by 4 c.c. of concentrated ammonia. This forms a hard crystalline compound with guaiacol, while the creasol after some time forms a semi-solid crystalline mass. On treating the mass with benzin, everything goes into solution but the ammonia compound of guaiacol.

Creasote should have a specific gravity of 1.080, should remain limpid with dilute sodium hydrate, and should not redden blue litmus paper.

Tests for the Purity of Phenocoll Compounds. (*Pharm. Zeitung*, September 19th, 1891, 586; *Pharm. Journ.*, 3rd series, xxii. 226.) Some of these compounds are likely to come into general use as antipyretics (see *Year-Book of Pharmacy*, 1891, 235). The following tests for purity are suggested:—Half a gram of phenocoll hydrochloride should dissolve clear in about 15 c.c. of water, and the solution should not turn ordinary litmus paper blue. Solution of ferric chloride should produce in the phenocoll hydrochloride solution only the faint yellowish colour of iron salts, but not a red coloration even upon warming. Heated to 60° C. and treated with a few drops of solution of sodium carbonate, the aqueous solution should not give off the odour of ammonia; with a few drops of caustic soda solution the phenocoll base should be thrown down as a white crystalline mass. Burnt on platinum, phenocoll hydrochloride leaves no residuc. For the acetate the same tests apply, except that the aqueous solution is faintly alkaline and the behaviour with ferric chloride is not the same. The free base melted under water and allowed to cool solidifies in crystals; it is also precipitated from a dilute aqueous solution by sodium chloride in long silky needles. Melted with caustic soda, ammonia and phenetidin are formed, and when an aqueous solution is boiled with a few drops of hydrochloric acid for a few minutes it shows faintly the reactions of phenacetin treated similarly.

Estimation of Proteids. L. Devoto. (*Zeitschr. für physiol. Chem.*, xv. 465-476.) The method described in this paper consists in precipitating the proteids by saturating with ammonium

sulphate and boiling; the reaction of the liquid may be acid, neutral, or alkaline. The precipitate is collected, washed, and weighed in the usual manner.

Detection of Tartaric Acid in Citric Acid. L. Crismer. (*Bull. de la Soc. Chem.* [3], vi. 23, 24.) On adding 1 gram of citric acid to 1 c.c. of a 10 per cent. solution of ammonium molybdate, and adding a few drops of a very weak solution of hydrogen peroxide (about 1 in 400), a yellow coloration is produced which does not alter on heating the mixture and maintaining it at a temperature of 100° C. for three minutes. In the presence of tartaric acid, however, a fine blue coloration is developed. The test is stated to be sufficiently delicate to admit of the detection of $\frac{1}{10}$ per cent. of tartaric acid.

Indirect Estimation of Alcohol. T. P. Blunt. (*Analyst*, 1891, 221-223.) When alcohol is estimated by the indirect or evaporation method, the spirit gravity is calculated, either by Tabarié's formula, which requires the division of the specific gravity of the sample by that of the extract, or by Mulder's formula, which is based on the assumption that the spirit gravity is obtained by deducting from the gravity of the sample the extract gravity minus 1000. The author has satisfied himself that in the case of sweet wines and liqueurs the last formula is the most accurate.

Indicators of Neutrality. R. A. Cripps. (*Chemist and Druggist*, November 28th and December 12th, 1891; also A. H. Allen, *Pharm. Journ.*, 3rd series, xxii. 752 and 772.) These two papers form a valuable report on the numerous indicators now in use; but as they cannot be reduced to abstracts without losing much of their value, we must confine ourselves in this place to calling the reader's attention to them, and refer him to the above sources.

Sensitive Test Paper. (*Répertoire de Pharm.*, 1892, 28.) An exceedingly sensitive test paper is obtained by immersing white filtering paper in tincture of turmeric, allowing it to dry, then treating each leaf separately with a 2 per cent. solution of potassium hydrate, and rapidly washing in pure water. After drying the paper is carefully kept protected from the air. It is exceedingly sensitive to acids, including also carbonic acid, and far exceeds litmus paper in the delicacy of its indications.

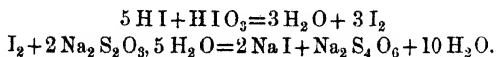
Estimation of Traces of Alkali. F. Mylius and F. Foerster. (*Ber. der deutsch. chem. Ges.*, xxiv. 1482-1498; *Journ. Chem. Soc.*, September, 1891.) The authors employ millinormal solutions and use iodo-eosin as an indicator. The crude colouring matter should

be purified by dissolving in aqueous ether, shaking the filtered solution with soda solution, and precipitating the sodium salt by the addition of concentrated soda solution. The salt is recrystallized from alcohol, dissolved in water, acidified with hydrochloric acid, and the precipitated iodo-eosin well washed with water. If used in the ordinary manner, this colouring matter is useless as an indicator; but if the titration is carried on in a stoppered bottle, in presence of ether, and the whole shaken on addition of the reagent, the point of neutrality is very distinctly shown, as in presence of the slightest excess of alkali the iodo-eosin passes from the aqueous to the ethereal solution, leaving the former almost colourless.

The titration with millinormal solutions allows of the detection of quantities of alkali equivalent to 0.1 milligram Na_2O , and even smaller amounts may be estimated by employing a colorimetric method. In carrying out the latter process a large number of precautions must be taken with regard to the neutrality of the water, the quality of the glass vessels employed, etc. For details of this method, reference must be made to the original, as they do not admit of a curtailed description.

Estimation of Nitrate by the Phenolsulphonic Acid Method. G. H. Bartram. (*Journ. Chem. Soc.*, September, 1891, from *Chem. News.*) Noting discrepancies in the results obtained in duplicate estimations of nitrates in water by the phenolsulphonic acid method, investigations were instituted which show that accurate results are obtained with freshly prepared phenolsulphonic acid, but that shortly after preparation, this reagent becomes susceptible to the action of chlorine when the quantity present is as much as, or more than four times, that of the nitric nitrogen, and the results may then be vitiated to the extent of showing a deficit of 20 or even 40 per cent. of the total nitric nitrogen actually present. This can, however, be obviated, either by removing the chlorides or by using freshly prepared phenolsulphonic acid.

Estimation of Iodate in Potassium Iodide. T. Gigli. (*L'Orosi*, xiv. 229-232.) The author's process is based on the following reactions:—



5 grams of the iodide are dissolved in 300 c.c. of water, 20 c.c. of a 2 per cent. solution of dilute sulphuric acid added, and the liberated iodine titrated with sodium hyposulphite in the presence

of starch. One molecule of the hyposulphite corresponds to $\frac{1}{2}$ molecule of potassium iodate.

Detection of Chlorides and Bromides in the Presence of Iodides.

D. S. Macnair. (*Chem. News*, vol. 66, 5.) When freshly precipitated moist silver iodide is heated with potassium bichromate and concentrated sulphuric acid, no iodine is set free, but the precipitate readily dissolves, forming silver iodate, which is precipitated, along with some silver bichromate, on diluting moderately and cooling the solution. Silver bromide, when treated in the same way, gives silver sulphate, the whole of the bromine being set free; while silver chloride behaves like the bromide, giving free chlorine and silver sulphate.

These reactions furnish an easy method of detecting chlorides or bromides in presence of iodides. It is only necessary to precipitate with excess of silver nitrate, filter off and wash the precipitate, and heat it with powdered potassium bichromate and a little strong sulphuric acid. If any chloride or bromide is present, even with a very large excess of iodide, its presence is easily detected by the evolution of chlorine or bromine.

Separation of Iodine, Bromine, and Chlorine. C. Schierholz. (*Monatshefte*, xiii. 1-39; *Journ. Chem. Soc.*, 1892, 1028.) When each of the three halogens is present in fair quantity, the author adopts an indirect method, in which two weighings only are necessary. Two equal volumes of the neutral solutions, in which the halogens are to be determined, are measured out, and one of them is accurately titrated with a $\frac{1}{20}$ normal silver nitrate solution. The number of c.c. required, a , and the weight of the silver precipitate, b , are accurately determined. The second portion of the solution is treated with a few grams of potassium bromide, and the same volume of the silver nitrate solution as was required to precipitate the halogens in the first portion is added. The solution is boiled for some time, diluted with water, and the weight, c , of the resulting precipitate, which contains all the iodine, all the silver, and some bromine, is noted. By means of the three values a , b , and c , the quantity of each halogen present can be readily calculated.

If only a small quantity of iodine and bromine is present with relatively much chlorine, the method of estimation depends on the facts that silver iodide is insoluble in moderately concentrated solutions of sodium chloride, and that bromine and chlorine can be separated by distillation with solutions of potassium permanganate and aluminium sulphate. For the latter process, the author

employs a distillation apparatus, consisting of a retort and condenser, and made of glass in one piece, the last portions of the bromine being expelled by boiling with a little dilute sulphuric acid. The bromine is absorbed in a flask containing dilute ammonia, whereby it is converted into ammonium bromide and probably partly into ammonium hypobromite; the whole of the bromine is, however, precipitated as silver bromide, on adding silver nitrate to the solution. This method of separating the iodine is only available when (say, in a mixture of sodium salts) it is present in the proportion of not more than 1 part of iodide to 6 or 7 of bromide and 1000 of chloride, under which circumstances, on the addition of a little silver nitrate, only silver iodide is precipitated, since silver bromide and silver chloride are soluble in strong sodium chloride solution. If, however, more bromide, or more iodide and bromide, are present than is indicated by the above-given ratio, it is best to precipitate and estimate the iodide as palladium iodide.

In making the above separations, the author has incidentally investigated the solubility of silver chloride, bromide, and iodide in solutions of the halogen salts of the alkalies, more particularly in sodium chloride. Such solutions dissolve 4 to 5 times as much of the halogen salts of silver at their boiling point as at the ordinary temperature. The concentration of the solution of the halogen salts of the alkalies has also a marked effect on the solubility of the silver compounds; a 10 per cent. solution of sodium chloride and a 1 per cent. solution of potassium iodide dissolving scarcely any recognisable quantity of the corresponding silver compounds. The very great difference between chlorine and iodine is shown both in the relative solubility of silver chloride and silver iodide, and in the different solvent power of the halogen alkali salts on silver nitrate, silver chloride, etc.; bromine occupying a position between chlorine and iodine. For example, 100 grams of sodium chloride or of potassium chloride in a 20 per cent. solution dissolves hardly a trace of silver iodide, whilst 100 grams of potassium iodide in concentrated solution dissolves about 90 grams of the salt, and a boiling saturated solution dissolves 4 to 5 times that quantity. Mixtures of the halogen salts of the alkalies, in particular proportions, are unable to dissolve as much of the silver salt as each can before admixture.

Separation of Copper and Cadmium. H. N. Warren. (*Chem. News*, lxi. 193.) Copper is completely precipitated from its solutions by glucose in the presence of Fehling's tartrate solution,

and may be readily and efficiently separated from zinc and cadmium by dissolving the alloy containing the three metals in nitric acid, diluting, mixing with excess of Rochelle salt and sufficient sodium hydrate, then adding a dilute solution of glucose in quantities of not more than 4 c.c. at a time to the clear boiling solution.

Separation of Copper and Cadmium. J. S. C. Wells. (*Chem. News*, lxiv. 294.) The neutral solution containing the two metals, which must be free from ammonium salts, is mixed with sufficient sodium hyposulphite to render it colourless. The cadmium is then precipitated with sodium carbonate, and the filtrate boiled with hydrochloric acid in order to throw down the copper as sulphide.

Detection of Tin, Antimony, and Arsenic. E. Pieszczyk. (*Archiv der Pharm.*, ccxxix. 667-669.) The antimony and tin sulphides are dissolved in concentrated hydrochloric acid (without addition of potassium chlorate), and to a drop of the solution placed on a platinum crucible lid a small piece of tin is added; any antimony is precipitated on the platinum as a brown or black deposit. If a trace of copper should be present, it is likewise precipitated, but the deposit is red, and has a metallic lustre, which is readily distinguishable from the antimony.

For the detection of tin, a piece of iron wire is placed in another portion of the solution of antimony and tin; any antimony which is present is precipitated, whilst the tin is reduced to stannous chloride, and may be detected by means of mercuric chloride.

Separation of Antimony from Arsenic. F. A. Gooch and E. W. Danner. (*Amer. Journ. Sci.* [3], xlii. 308-312. From *Journ. Chem. Soc.*) A very exact process for the separation of arsenic from antimony consists in distilling their hydrochloric acid solution with ferrous sulphate; but the conditions are such that the antimony in the residue must be determined gravimetrically. The authors have so arranged the process that the estimation of the antimony may be made by a rapid volumetric method, and this they have accomplished by substituting for the iron salt, which interferes with the direct volumetric estimation, another reducing agent, namely hydriodic acid. After a great number of experiments, the authors now recommend the following process:—

The solution, which must not contain more than 1 gram of the mixed oxides of antimony and arsenic, is mixed with a slight excess of potassium iodide, diluted with hydrochloric acid to 100 c.c., and then saturated with hydrogen chloride, which is also passed during the subsequent distillation. The apparatus consists of a 250 c.c. flask, provided with a hollow glass stopper tightly

fitted in a ground joint, the stopper itself being sealed on a large glass tube bent suitably to connect the interior of the flask with a condenser, whilst through the hollow stopper, and sealed into it, passes a smaller glass tube reaching nearly to the bottom of the flask. By means of this arrangement, a current of gas entering the smaller tube passes nearly to the bottom of the flask, and then out through the hollow stopper into the condenser, without coming in contact with joints, rubber, or cork.

The distillation is continued until fully one-half of the liquid has passed over, when the residue is quickly cooled. Sulphurous acid is added, and, after a little while, the excess of this reagent is destroyed by cautiously adding solution of iodine. After the addition of 1 gram of tartaric acid for every gram of antimony supposed to be present, the free acid is nearly neutralized with sodium hydrate, and 10 c.c. of a solution of sodium hydrogen carbonate is then added. The antimony is now estimated by titrating the solution with N/10 iodine.

Test for Cerium Salts. P. C. Plugge. (*Archiv der Pharm.*, 1891, 558) This test consists in a reverse application of the strychnine reaction proposed by Sonnenschein. The solution of the salt to be tested is mixed with a slight excess of sodium hydrate, the mixture evaporated to dryness, and the residue treated with a few drops of solution of strychnine in concentrated sulphuric acid (1 : 1000). In the presence of 0.01 milligram of cerium salt, a faint and vanishing blue violet coloration is developed; if 0.1 milligram be present, at first a blue and later a permanent red coloration results.

Assay of Chrome Yellow. A. Lachaud and C. Lepierre. (*Bull. de la Soc. Chim.* [3], vi. 235-237.) The sample is shaken with standardised solution of potassium hydrate until the chromate is decomposed. The mixture is then diluted with distilled water, the alkaline solution decanted from the precipitated basic chromate of lead, and titrated with standard sulphuric acid in the presence of phenolphthaleïn.

A Delicate Reagent for Tannin. M. Baemes. (*Monit. Pharm.*, 1891, 1006.) A solution of 1 gram of sodium tungstate and 2 grams of sodium acetate in 10 c.c. of water yields with either acid or alkaline solutions of tannin a straw-coloured precipitate. The test is stated to be very sensitive in its indications.

Analysis of Gambier. H. R. Procter. (*Journ. Soc. Chem. Ind.*, x. 681-683.) According to the author, the process of assay which finds most favour with both English and Continental

chemists is the indirect gravimetric method, in which equal quantities of the infusion of the tanning material are evaporated, in the one case after careful filtration through paper only, and in the other after complete removal of the tanning matter by treatment with purified hide powder; and the tanning matter is calculated from the difference of weight of the dried residues.

Assay of Indigo. F. A. Owen. (*American Druggist*, January 1st, 1892.) Two separate quantities of 1 gram each of the sample are operated upon as follows:—In one the moisture and ash are determined; the other is first pulverized dry, then levigated with water, the suspended portion poured off, and the process repeated until all is transferred to a 200 c.c. flask. Three grams of zinc dust and 60 c.c. of commercial strong ammonia are then added, the flask filled to $\frac{1}{2}$ c.c. above the mark, and shaken occasionally until reduction is complete (possibly from half an hour to two hours). Fifty c.c. of the clear solution are then put in an evaporating basin, 5 or 6 drops of ether added, and air blown through to precipitate most of the indigotin. A moderate excess of hydrochloric acid is now added, the whole heated to boiling, and the precipitated indigotin collected on a tared filter, dried at 100°, and weighed.

Analysis of Commercial Starches. A. Baudry. (*L'Union Pharm.*, April, 1892, 63; *Amer. Journ. Pharm.*, April, 1892.) The author proposes an analysis based on the following facts:—(1) Salicylic and benzoic acids completely dissolve starch on heating; (2) the soluble starch is dextro-rotatory; (3) the deviation is proportional to the amount of dissolved starch for the same length of tube. The manner of applying this method is the following:—3.321 grams of starch to be analysed are placed with 80–90 c.c. of water in a flask of 200 c.c. contents. To this is added .5 gram of salicylic acid, the whole boiled from 20–25 minutes, then sufficient cold water is added to make about 190 c.c., and the contents are then cooled. Lastly 1 c.c. of ammonia is added, the quantity made up to 200 c.c., shaken and filtered. The liquid is examined in a 400 min. tube, giving the amount of anhydrous starch in the sample, if a saccharometer is used whose 100 divisions correspond to 10 grams of saccharose (Vivian). If a Laurent saccharometer is used where the divisions correspond to 16.198 of saccharose, only 2.688 grams of starch are to be employed. In this case the number of degrees observed multiplied by 2 gives the percentage. For determining the quantity of impurities it is only necessary to filter the soluble starch through two equipoised filters, one placed

within the other, and then washing the residue with boiling water until the filtrate gives no reaction with ferric chloride. The filters are then dried and weighed.

New Test for the Detection of Vegetable Oils in Lard. P. Welmans. (*Pharm. Zeitung*, 1891, 798, and 1892, 22; *Amer. Journ. Pharm.*, February, 1892.) If 1 gram or 25 drops of a fixed oil be dissolved in 5 c.c. of chloroform in a test-tube, 2 c.c. of phosphomolybdic acid or sodium phosphomolybdate solution, and a few drops of nitric acid added, there will be produced upon agitation an emerald-green mixture; upon standing two layers will separate, the lower chloroform solution being colourless, and the upper layer beautifully green. It is thought that the reaction is due to the vegetable oils containing minute quantities of alkaloïds or glucosides which reduce the phosphomolybdic acid. The colour is obtained with all these oils if they have not been chemically treated to remove acidity or colour; in such cases the colour may not be developed, or only after some time. If the acid solution be supersaturated with an alkali or alkaline carbonate, the green colour changes to a blue, the intensity of which corresponds to the green colour. Mineral and animal fats (paraffin, vaselin, lard, etc.), excepting cod-liver oil, will not give the green colour. To test lard for such adulteration one gram is dissolved in chloroform and then proceeded with as mentioned. Another test for fixed oils, which is serviceable in detecting cotton-seed oil in lard, is to add to the lard a cold saturated solution of picric acid in ether and allow the solvent to slowly evaporate; pure lard will then show a lemon-yellow colour, whereas, admixed with cotton-seed oil, it will have a brown-red colour; pure cotton-seed or other fixed oil will become brown. Phospho-tungstic acid will also suffer reduction through the fixed oils, especially cotton-seed oil and cod-liver oil; in this case there is produced a violet coloration which on addition of excess of alkali (ammonia) changes to a beautiful blue, but the colorations with this reagent are not as permanent as with phosphomolybdic acid.

Detection of Mineral Oils in Fixed Oils. P. Soltsien. (*Amer. Journ. Pharm.*, November, 1891.) The author treats the oil with concentrated sulphuric acid, and, after the action is complete, agitates thoroughly with petroleum-ether, separates the latter, evaporates it, and examines the residue left on evaporation. The process depends upon the formation of compounds of the fixed oils and sulphuric acid which are not soluble in petroleum-ether, while the mineral oils are not changed and are therefore soluble in petro-

leum-ether. The presence of small quantities of resin oil in boiled linseed oil was detected by this method.

Estimation of Fat in Vaseline. M. Vizern and C. Nicolas. (*Journ. Chem. Soc.*, November, 1891.) Caustic alkalies are without action on the normal constituents of vaselin in the process to be described, whilst they combine in definite proportions with the fats to form soaps. It has been experimentally determined that 10 grams of these fatty compounds absorb 1.635 grams of potassium oxide, K_2O , and the calculations are based on this. A standard alkali solution is prepared by dissolving about 20 grams of potash in 100 c.c. of 90° alcohol. This is standardised by means of standard sulphuric acid. A neutral alcohol is prepared by dissolving 1 c.c. of phenolphthalein in 500 c.c. of 90° alcohol, then alkali is stirred in drop by drop until a very slight rose tint is produced. 10 grams of the vaselin to be tested are placed in a 200 c.c. porcelain basin, 10 c.c. of standard alkali added, the basin being kept on a water-bath during the whole process. 50 c.c. of neutral alcohol are now added, the solution heated nearly to boiling, and the mixture stirred for eight minutes, when the saponification will be complete, and normal sulphuric acid added drop by drop until all colour has disappeared; this point is very important. If too long a time has been taken, it may be necessary to add a fresh portion of neutral alcohol to replace the loss by evaporation. The amount of sulphuric acid run in subtracted from that required to saturate 10 c.c. of alkali solution, multiplied by 0.0047, gives the quantity of potash absorbed by the fats in 10 grams of vaselin, and this number divided by 0.01635 gives the percentage of fats in the vaselin.

The Analysis of Beeswax. C. Mangold. (*Analyst*, August, 1891.) The author recommends the following modification of the process described by A. and P. Buisine (*Bull. Soc. Chim.*, 1890, 3, 567):—2-10 grams of the wax are melted and saponified by potash-lime, the reaction being aided by stirring. The saponified product is powdered when cold, intimately mixed with three times its weight of potash-lime, and the mixture transferred to a thick-walled, pear-shaped bulb-tube, which is heated to 250° C. for three hours in a mercury bath contained in an iron vessel. This vessel is provided with a lid which screws on air-tight, pierced with four apertures through which pass air-tight, respectively, the pear-shaped bulb, a thermometer, a thermostat, and a long tube open at both ends to condense any mercury which may volatilize. A tube connects the pear-shaped bulb with a Hofmann's burette,

in which the hydrogen is measured. After the completion of the reaction, the residue in the bulb-tube and the bulb-tube itself are powdered and extracted for some hours with petroleum ether in a Soxhlet's tube, the ether distilled off, and the residual hydrocarbon dried at 110° C. and weighed.

Schwalb has already noted (*Annalen*, 1886, 235, 149) that pure beeswax itself contains about 6 per cent. of hydrocarbons; while A. and P. Buisine have found as much as 12.5–14 per cent., a result confirmed by the author. In endorsing this statement, he arrived at the conclusion that as little as 2 per cent. of foreign hydrocarbons may be detected. The best approximation to the true proportion of paraffin is said to be obtained by assuming the quantity of hydrocarbons normally present in beeswax to be 13.5 per cent.

The following table gives some figures for unbleached beeswax of diverse origins:—

Source of Sample.	Hydrocarbons.	Acid Number.	True Saponification Number (after deduction of acid number).
Aussec	13.51	19.79	72.51
Native	13.75	20.44	70.65
"	14.72	20.42	67.84
Dalmatia	14.51	18.81	71.99
Hungary	14.60	23.04	66.55
Bosnia (Banjaluka) . .	14.27	19.31	—
Slavonia	13.76	20.95	70.23
Carniola	13.64	20.08	69.62
Bosnia (Dolna-Tulza) .	13.92	20.02	70.37
Lower Styria	14.34	18.26	72.50
Lower Austria	13.72	20.58	67.83
Mozambique	13.37	19.42	71.78
Chili	13.35	19.99	70.01
Monte Cristo	13.50	20.24	67.45
Morocco	11.02	21.66	77.02
Bombay	14.04	—	—
Madagascar	11.77	20.03	72.85
Saffi	12.20	19.92	73.48
Oran	11.55	19.91	79.99
Massadah	12.80	21.11	69.49
Mogador	11.40	20.85	75.55

A sample of yellow beeswax from Transylvania had an acid number of 16.66, and a total acid number of 72.68; that is to say, a true saponification number of 56.02, plainly indicating that it was adulterated with paraffin or some similar hydrocarbon. The total percentage of hydrocarbons was 28.12, corresponding to an

addition of 17 per cent. of paraffin calculated on the original wax. The percentage of hydrocarbons and the total acid number of the mixture being known, the total acid number of the original wax could be calculated, and was found in this case to be 87.6. A mixture made by adding 8 per cent. of paraffin to a genuine sample of beeswax gave figures on analysis corresponding to an addition of 7.4 per cent.

A few figures for bleached beeswax are also given :—

Source of Sample.	Hydrocarbons.	Acid Number.	True Saponification Number (after deduction of acid number).
Smyrna	10.93	20.87	68.33
Egypt	11.35	20.04	69.94
Transylvania	13.61	24.68	
Hungary	15.48	23.05	79.49

According to A. and P. Buisine, bleached wax gives a lower result for hydrocarbons than yellow wax; the last two samples were apparently impure, and had been bleached by chemical means.

Detection of Vegetable Fibres in Silk or Wool. S. Fabino. (*Amer. Journ. Pharm.*, June, 1892.) The method recommended by the author is based upon the conversion of cellulose into sugar, and the decolorization of the colouring matter of orchil in the presence of sugar and alkali. A small piece of the fabric under examination is made to imbibe several drops of sulphuric acid of 66° B.; after 5 or 10 minutes 5 c.c. of distilled water are added, and the whole is heated to boiling, the liquid decanted, and gradually mixed with concentrated solution of caustic soda until it is strongly alkaline. In the next place a few drops of a dilute solution of extract of orchil are added, and the violet liquid is heated for several minutes to 90°; if cotton, flax, or other vegetable fibre was present, it will be decolorized (on exposure to the air the original colour will be reproduced). Should the violet colour of the liquid remain after five minutes' heating, the fabric is free from vegetable fibre, or at most contains but a minute proportion of the same.

Röse's Process for the Estimation of Alcohol. L. Grünhut. (*Chem. Zeitung*, xv. 847-848; *Journ. Chem. Soc.*, 1892, 1031.) A few years ago, Röse proposed a new process for the direct estimation of alcohol. A small quantity of the sample is largely diluted

with water, mixed with a large excess of potassium permanganate, and then suddenly mixed with an excess of strong sulphuric acid. After a few minutes, the alcohol is supposed to be completely oxidised to carbonic anhydride and water. The excess of permanganate is destroyed by the addition of a known quantity of potassium tetroxalate, the excess of which is then in turn estimated by permanganate. R  se's preliminary experiments were very satisfactory.

The author has however found, as Benedikt did previously, that the reaction does not proceed regularly on these lines, and that a good deal depends on the amount of sulphuric acid, which, if added in insufficient quantity, causes a very incomplete oxidation. If, on the other hand, too much acid is added, an independent decomposition of the permanganate will set in, and the result will be untrustworthy.

The process cannot, therefore, be recommended for the estimation of alcohol in technical products.

The Fermentability of Dextrins. L. Medicus and C. Immerheiser. (*Zeitschr. f  r analyt. Chem.*, xxx, 665-668. From *Journ. Chem. Soc.*) Some specimens of wine, which the authors had condemned as adulterated with potato-starch sugar, were by other analysts described as genuine on the ground of the complete fermentability of their dextrorotatory constituents. The authors confirm the fact of this complete fermentation under the influence of pressed yeast. It takes place, however, very slowly. Specimens exhibiting originally a dextrorotation of $0.45-0.83^\circ$ lost this entirely in from 25 to 28 days after mixing with pressed yeast. That the substances so fermented were dextrins was shown by the behaviour towards Fehling's solution after inversion, a much greater increase in the reducing power being found after treatment capable of saccharifying dextrin than after simple inversion of the cane sugar present. These results were confirmed by experiments on commercial potato-starch sugar. 250 c.c. of a 16 per cent. solution mixed with a little ammonium and potassium phosphates, and 2 grams of pressed yeast, fell off in rotating power from 17° to 7° in 11 days at ordinary temperatures, and on further addition of yeast and elevation of the temperature to 30° , the polarisation was finally reduced to about 1° in the course of 34 days. In a second experiment on solutions of the same strength without phosphates, but with more yeast, the rotation fell to 0 after the lapse of 32 days. In a third experiment, dextrin precipitated by alcohol from potato-starch sugar, and thoroughly washed with alcohol, was employed with a precisely

similar result. The conclusion arrived at is that dextrin, although with difficulty, is yet completely fermentable under the influence of vigorous pressed yeast and at a favourable temperature.

Recognition of Potato-Starch Sugar in Wines. W. Fresenius. (*Zeitschr. für analyt. Chem.*, xxx. 669-672.) The statement of Neubauer that the substances precipitable from potato-starch sugar were not fermentable having been based on experiments with beer yeast, and the investigations of v. Raumer having shown that the behaviour of these substances was not identical with different kinds of yeast, the following further experiments were made:—A specimen of one of the dextrorotating wines examined by Medicus (see preceding abstract), and an optically inactive wine, were evaporated to syrups, and mixed, the former with a 10 per cent. solution of completely fermentable invert sugar, and the latter with a 10 per cent. solution of potato-starch sugar containing so-called "unfermentable substances." Under the influence of pressed yeast at 30°, both lost their rotating power completely in four days. In a similarly conducted experiment with a non-polarising wine mixed with potato-starch sugar and beer yeast, the solution still showed a rotation of 5° after 13 days. Specimens of the suspected wines were therefore evaporated, and mixed with fermentable invert sugar and beer yeast. The observed result is not given, but it is stated that a thoroughly satisfactory proof was obtained that potato-starch sugar had been introduced into the wines. In the course of the experiments, it was observed that the wines were very apt to become mouldy on the surface, and after the growth of mould the dextrorotatory constituents were found to have disappeared. The same was the case with nitrates, which had been detected by Medicus and Immerheiser, but had disappeared by the time the samples were examined by the author.

Note on the Volumetric Estimation of Zinc by means of Potassium Ferrocyanide. L. Blum. (*Zeitschr. für analyt. Chem.*, xxx. 60-61.) The presence of manganese is known to have a disturbing effect in the titration of zinc by means of potassium ferrocyanide. The author therefore suggests that, previous to the titration, the solution should be treated with bromine water, ammonia, and ammonium carbonate, whereby manganese, iron, and the alkaline earths are precipitated, while the zinc is left in solution.

Estimation of Zinc by the Ferrocyanide Process. F. Moldenhauer. (*Chem. Zeit.*, xv. 223-224; *Journ. Chem. Soc.*, July, 1892, 915.) The estimation of zinc by means of potassium ferrocyanide, with copper sulphate paper as indicator, is gradually superseding

the old process with sodium sulphide; but certain precautions should be taken to avoid errors. The standard solution of ferrocyanide is best made of such a strength that 1 c.c. equals 0.005 gram of zinc. This solution does not keep well, but decomposition may be retarded by the addition of 1 gram of potassium hydrate per litre, and keeping the liquid in the dark. The author has investigated the influence of the presence of some other metals which are often associated with zinc. Of the alkaline earths and the lighter metals, there exist only two whose ferrocyanides are quite insoluble in ammonia, namely, zinc and manganese, whilst magnesia is sparingly soluble. In the presence of these two metals, the amount of zinc may be found from 3 to 6 per cent. too high. The author has therefore modified the process as follows:—2.5 grams of the zinc ore are dissolved in hydrochloric acid, oxidised with nitric acid, and, without filtering, diluted to 250 c.c. 50 c.c. of this solution are heated and mixed with 10 c.c. of ammonia and 5 c.c. of a solution containing, in 100 c.c., 5 grams of ammonium chloride, 5 grams of ammonium carbonate, and 10 c.c. of ammonia. While the mixture is cooling, 50 c.c. of the original liquid are mixed with 10 c.c. of ammonia and carefully titrated with the ferrocyanide.

When cold, 1 c.c. of a 10 per cent. solution of disodium hydrogen phosphate is added, which will precipitate any manganese or magnesia as phosphate. The titration is now most carefully repeated, and will, of course, often give a lower result than the first.

The test analysis, made on an artificial zinc ore, is very satisfactory.

Detection of Arsenic in Metallic Iron. O. Sautermeister. (*Chem. Zeitung*, xv. 1021-1022. From *Journ. Chem. Soc.*) The author, applying the official test of the German Pharmacopœia, could get no reaction for arsenic even when 0.1 gram of arsenic trioxide was purposely added. The test consists in dissolving 1 gram of the metal in dilute hydrochloric acid, in a Marsh's apparatus, and allowing the hydrogen flame to play upon a porcelain dish. An examination of the insoluble residue revealed, however, the presence of arsenic, which had been reduced to the metallic state. This fact was indeed known to Wöhler in 1839, but has since been overlooked.

The test is, however, more satisfactory when about 2.5 grams of zinc are added to the iron. Although the arsenic does not show at first, it will be gradually evolved when the hydrogen comes off

briskly. 0.1 per cent. of arsenic in a sample of iron may be detected in this manner.

Preparation of a Permanent Solution for the Determination of Hardness. H. Couronne. (*Moniteur scientifique* [4], vi. 23-26.)—As pure oil-soaps are now not so readily met with in commerce, the author recommends that the soap intended for this titration be prepared in the laboratory by saponifying 28 grams of olive oil or oil of almonds with 10 c.c. of solution of caustic soda of 36° B. and 10 c.c. of 90 per cent. alcohol. The product is dissolved in alcohol of 60 per cent. to make up one litre. Such a solution keeps very well, and is not liable to gelatinize.

Use of Bromic Acid in Quantitative Analysis. W. Feit and K. Kubierschky. (*Chem. Zeitung*, xv. 351-352; *Journ. Chem. Soc.*, 1892, 910.) The authors have found that bromic acid, or, what amounts to the same thing, a solution of potassium bromate in dilute sulphuric acid, from which any free bromine may be expelled by boiling, is a very handy laboratory reagent. It acts as a powerful oxidiser, and the liberated bromine may be very readily expelled by boiling. The authors proceed in the following manner:—An accurately measured excess of the bromate solution, which must contain excess of sulphuric acid, is put into a 200 c.c. flask, the substance is added, and the whole gradually heated to boiling. After about five minutes, the bromine will be practically expelled, and no notice need be taken of a trace of a yellow colour. After cooling, the liquid is made up to the mark, and the excess of undecomposed bromic acid is estimated in an aliquot part of the liquid by means of potassium iodide and sodium thiosulphate. The authors communicate some very successful quantitative experiments. Hydrogen sulphide is oxidised to sulphuric acid and water. Sulphurous anhydride and hydrogen thiosulphate are also completely oxidised to sulphuric acid and water. Nitrous acid is oxidised to nitric acid, and oxalic acid is oxidised to carbonic anhydride and water.

The process may also be applied to ferrous salts. As the ferric compound obtained would interfere with the iodometric estimation, it must first be removed by a cautious addition of sodium carbonate. After making up to the mark and allowing to settle, the bromate may be estimated as usual after acidifying with sulphuric acid.

The authors have every reason to believe that bromic acid may become a useful reagent in the synthesis of organic compounds.

Quantitative Separation of Strontium from Calcium by means of Amyl Alcohol. P. E. Browning. (*Ber. der deutsch. chem. Ges.*, xxv. 293.) The author's process is based on the ready solubility of calcium nitrate in boiling amyl alcohol, and the comparative insolubility of strontium nitrate in this solvent. The separation is effected in the following manner:—The solution of the nitrates is evaporated in a beaker, the residue dissolved in the smallest requisite quantity of water, the solution treated with 30 c.c. of amyl alcohol, the mixture heated to the boiling point, and then poured upon an asbestos filter. Any strontium nitrate left in the beaker is gently heated to remove the adhering amyl alcohol, then dissolved in a few drops of water acidulated with one drop of nitric acid, the solution evaporated to dryness, the residue again dissolved in the smallest requisite quantity of water, then heated to the boiling point with another 30 c.c. of amyl alcohol, and the hot mixture poured upon the same asbestos filter. After the whole of the strontium nitrate has been removed to the filter, it is washed with small quantities of amyl alcohol, then dried in an air-bath at 150° C., and weighed. The filtrates are evaporated to dryness in a platinum crucible; the residue is ignited, and the calcium salt converted into sulphate and weighed as such.

As a correction for the solubility of the strontium nitrate in amyl alcohol, 0.0020 gram should be added to the weight of the strontium oxide obtained, and 0.0035 gram deducted from the weight of the calcium sulphate.

Quantitative Separation of Barium from Calcium by means of Amyl Alcohol. P. E. Browning. (*Amer. Journ. Sc.*, xliii. 314-317.) The process adopted by the author is the same as the one described in the preceding abstract for the separation of strontium and calcium. Owing to the total insolubility of barium nitrate in amyl alcohol, no correction is needed in this case.

Separation of Strontium and Calcium as Chromates. W. Fresenius and F. Ruppert. (*Zeitschr. für analyt. Chem.*, xxx. 672-680; *Journ. Chem. Soc.*, July, 1892, 914.) An aqueous solution of the chlorides (containing preferably not more than 3 per cent.), mixed with potassium chromate, warmed to 60-70°, and mixed with one-third of its volume of strong alcohol, gives a precipitate almost instantly when strontium is present, but none in its absence, or only after a long time a trifling one, which cannot be mistaken for the strontium precipitate. About 0.0004 gram of strontium chloride per c.c. appears to be the lower limit of detection, in the presence of six times as much calcium chloride.

A larger proportion of alcohol should be avoided; with 6 vols. of alcohol to 10 of the aqueous solution, calcium chromate began to precipitate. The method can be used only for rough quantitative separation; 50 c.c. of alcohol of 29 vols. per cent. dissolve 0.0066 gram of strontium chromate, or 0.608 gram of calcium chromate. In alcohol of 53 vols. per cent., the solubility is 0.44 gram of calcium chromate and 0.001 of strontium chromate in 50 c.c.

For qualitative analysis, the two bases should be precipitated as carbonates, the precipitate dissolved in hydrochloric acid, the excess of acid evaporated off, and the dilute aqueous solution mixed with potassium chromate and one-third its volume of alcohol, and shaken.

Volumetric Estimation of Phosphoric Acid in Manures. M. Spica. (*Gazz.*, xxii., I. 117. From *Journ. Chem. Soc.*) The author recommends the following process:—The weighed sample is cautiously heated with concentrated sulphuric acid in a small porcelain capsule until almost all the sulphuric acid is driven off; all the phosphoric acid is now in the free state, and is extracted from the residue by absolute alcohol, the metals remaining as sulphates insoluble in alcohol. The alcoholic solution is now filtered and evaporated on the water-bath to expel the alcohol. The residue is dissolved in water, rendered exactly neutral with soda, made up to a known volume, and an aliquot part taken for the titration. The solution is titrated in the cold with standard potassium ferric alum solution. On running in the ferric solution, a white precipitate of ferric phosphate separates. Aqueous salicylic acid solution is used as the indicator; an amethyst colour is produced when excess of iron is added. The solution must be exactly neutral when titrated, for if it be alkaline, ferric hydrate will be precipitated, whilst, if acid, part of the ferric phosphate will be dissolved. 1 c.c. of the ferric solution may conveniently be made equivalent to 1 milligram of P_2O_5 .

Estimation of Phosphoric Acid in Fertilisers. F. B. Dancy. (*Chemical News*, lrv. 162–163, 170–172.) The author shows that the method of dissolving in nitric acid with a small quantity of hydrochloric acid and precipitating by molybdate is not applicable for determining phosphoric acid in fertilisers containing cotton-seed meal, inasmuch as, although they dissolve readily enough, the solutions do not give up their phosphoric acid to molybdate, and therefore low results are obtained. Moreover, solution in hydrochloric acid and potassium chlorate has proved, in some instances, inadequate for the purpose. Fusion with equal parts of

sodium carbonate and potassium nitrate gives maximum results, but takes too long, whilst incineration and subsequent solution of the ash in nitric acid sometimes gives low results, owing to the ignited phosphate not being completely soluble in that solvent; this difficulty is apparently overcome by dissolving the ignited residue in hydrochloric acid, in which it is readily and wholly soluble. This, therefore, furnishes a satisfactory basis for a desirable method.

MATERIA MEDICA AND PHARMACY

PART II.

MATERIA MEDICA AND PHARMACY.

Investigation of Sarsaparilla. W. v. Schulz. (*Brit. Med. Journ.*, No. 1640; *Chemist and Druggist*, May 14th, 1892.) The author has isolated from sarsaparilla root a third glucoside, "*sarsasaponin*," $C_{22}H_{36}O_{10}$, which along with Flückiger's *parillin*, $C_{26}H_{44}O_{10}$, and Dragendorff's *sarsaparill-saponin* (*smilacin*), $C_{20}H_{32}O_{10}$, forms a series of homologous compounds of the general formula $C_nH_{2n-8}O_{10}$. On boiling with dilute acids, all these glucosides split up into *sarsapogenin* or *parigenin* and one or more molecules of sugar. Pharmacologically considered, the three glucosides of sarsaparilla belong to the group of *sapotorin*. They do not seem to be readily absorbed into the system so long as the intestines are in a normal and healthy condition, but their action appears to depend upon the production of nausea and motions of the bowels. Subcutaneous injections of any of the three substances caused large purulent abscesses, sarsasaponin apparently possessing the most intense action when introduced into the blood, and only requiring 50 milligrams per kilo. of body-weight as a lethal dose for cats and dogs. Parillin is next in activity, with 120-150 milligrams for the lethal dose, whilst sarsaparill-saponin was found to require a dose of 165-230 milligrams. The three saponins act as cardiac muscle and nerve poisons in intravenous injections, and cause hæmoglobinuria even in small doses.

True and False Pareira. F. A. Ringer and E. Brooke. (*Pharm. Journ.*, 3rd series, xxii. 703.) The authors have examined a sample of a substitute of pareira, received by them from Mr. E. M. Holmes, which has recently come into the market in large quantities, its botanical origin being unknown. They noticed that while the genuine root cut like very hard wax, the spurious one when cut crumbled into pieces. The powder of the true *Pareira Brava* was much lighter in colour but heavier in weight than the substitute.

The results of their chemical examination are summed up as follows:—The substitute contains much less ash, less mucilage, less alkaloid, a much smaller proportion of fats and fatty acids, a small quantity of an acid resin, no starch, and affords a much smaller quantity of extractive matter.

The Microscopical Characters of a Spurious Pareira Brava from Bahia. W. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 829–831.) At the request of Mr. E. M. Holmes the author has examined the microscopical characters of a spurious variety of *Pareira Brava* from Bahia, which entered into commerce about the end of 1890. A chemical examination of the same drug forms the subject of the preceding abstract. It consists of pieces of both stem and root, the microscopical characters of which are described as follows:—

Stem.—As seen in transverse section the stem has a small but well-marked medulla, composed of round and oval cells somewhat smaller than the medullary cells of a stem of the same size of the chondodendron. Some of these cells contain starch granules and others numerous small crystals (apparently octahedral and probably calcium oxalate). Scattered throughout the medulla are numerous groups of sclerenchymatous cells with evident canaliculi, and with the central cavity almost obliterated. The layers of thickening are very distinct. There is not the same gradual transition of the cells of the medulla into the medullary rays that obtains in chondodendron. Immediately surrounding the medulla is an almost continuous zone of thickened cells, the cavities of which are blackened by treatment with iodine. These cells are more numerous at the apex of each of the wedge-like woody bundles. The medullary rays are narrow, composed of tabular cells elongated in a radial direction, which dividing at the end and meeting a corresponding division from the next ray overlap the bases of the woody wedges in the same manner as in true pareira. The wedge-shaped woody bundles in the zone immediately outside the medulla are much shorter than in chondodendron, and the succeeding zones are arranged much more uniformly. They are composed of thickened wood-cells and are perforated by numerous large vessels, the cavities of which are frequently filled by secondary growths. Outside the first zone of woody bundles there is a layer of sclerenchyma composed of polygonal cells with numerous and well-marked canaliculi. This is broken at intervals by crescent-shaped patches of thickened prosenchyma (bast), which are more conspicuous than the similar

structures in chondodendron. The layer of sclerenchyma has conical projections opposite the medullary rays, which fill the spaces left by the bifurcation of the latter.

In the stem of true pareira there is a considerable amount of parenchyma outside this layer, composed of cells elongated in a tangential direction, and this also obtains with the cells in the middle of the large medullary rays, whereas in the spurious variety now under investigation the woody bundles of each successive zone begin almost close up to the sclerenchymatous layer. This is stated to be a distinguishing mark of some value. The remaining zones are each surrounded by a continuous layer of sclerenchyma. Starch is present to about the same extent as in the stem of chondodendron, but a decoction of either gives only a rusty-red colour with iodine. The cells of all the parenchymatous tissue contain numerous small, apparently octahedral crystals, which might be mistaken for starch granules unless tested with iodine. A longitudinal section shows numerous vessels, with thickening distributed in oval patches, gradually passing into reticulated fibres. These vessels have numerous prolongations from their walls meeting similar prolongations from contiguous vessels. The large vessels of the woody bundles are pitted with numerous slit-like markings, arranged in a spiral manner. The wood fibres themselves present similar markings, and some with bordered pits also occur.

Root.—A longitudinal and tangential section of the roots, both of the true and spurious pareira, shows that the woody bundles are arranged in an open network. Dotted and reticulated vessels, with lateral prolongations similar to those in the stem, are abundant in both kinds, and are especially evident when the sections are not perfectly exhausted of air. In a transverse section the cavities of the pitted vessels in the woody bundles of the root of chondodendron are seen to be not more than half the diameter of those in the stem. This is an important character. Starch is much more abundant in the root of true pareira than in the stem. All the parenchymatous tissue, even that considerably thickened by secondary deposits, is full of it. The granules are mostly compound, but not of large size. Crystals, apparently octahedral, are also present. The root has much the same general structure as the stem, as far as the distribution of the woody bundles is concerned.

A comparison of a section of the root of spurious pareira with the section of the root of chondodendron revealed the following differences:—

1. The vessels in the woody bundles of the spurious are about twice the diameter of those in true pareira.

2. The sclerenchymatous tissue outside each zone is more conspicuous.

3. The bases of the woody wedges are concave. In true pareira they are nearly straight.

4. The mass of parenchyma at the base of the wedges is in consequence nearly circular.

5. The spurious pareira contains only a few scattered grains of starch.

6. The medullary rays are narrow in the spurious variety, and the cells are elongated in a radial direction. In true pareira they are broad, and the central cells elongated transversely. They are also loaded with starch granules.

7. The zones of the spurious are more regular in size, and the number of the woody wedges is greater. The point from which the wedges radiate is very eccentric.

For purposes of ordinary examination it is only necessary to make a clean section of the drug with a sharp knife or razor, and examine the cut surface with a good lens; but when a thin section is required for more detailed examination under the microscope, a piece should be soaked in water for a day or two. It is then comparatively easy to make a thin section, which should be stained in the usual manner.

The author's descriptions of the vascular bundles of the spurious pareira from Bahia, of *chondodendron tomentosum*, and of the West African pareira are illustrated by woodcuts.

Commercial Powdered Rhubarb. B. S. Proctor. (*Chemist and Druggist*, April 23rd, 1892.) The amount of natural fat and other substances extracted by chloroform from genuine rhubarb is stated by Dragendorff to be about 0.15 per cent. The author found in an undoubtedly genuine sample ground by himself 0.2 per cent., while ten samples of commercial powders proved to contain quantities varying from 0.4 to 2.2 per cent. The presence of added oil in commercial powdered rhubarb appears therefore to be of frequent occurrence.

The Rhizome of *Aspidium Athamanticum*. R. Kürsten. (*Archiv der Pharm.*, 1891, 258.) This drug, which is used in South Africa as a tænicide, is described by the author under the name "Rhizoma Pannæ." It differs from the rhizome of male fern in its larger size, and in the microscopic structure of the glands found inside the intercellular cavities. Its active principle is named by the

author *pannic acid*, and stated to be a body closely resembling filicic acid, but differing from the latter in its ready solubility in strong alcohol, its higher melting point (187°C.), and its behaviour on heating.

The rhizome is known in South Africa under the name "un-comocomo."

Morrenia Brachystephana. P. Arata and C. Gelzer. (*Ber. der deutsch. chem. Ges.*, xxiv. 1849-1853.) The authors have examined the roots of *Morrenia brachystephana* (tásis), the sap of which is employed in the Argentine Republic as a specific for deficient lacteal secretion. They have isolated a bitter alkaloid, "*morreine*," which is soluble in water, chloroform, and amyl alcohol, and fuses at 106° . In addition to this the root was found to contain wax, fatty acids, and several resins. The alkaloid may be prepared by digesting the roots for three or four days with water containing 2 per cent. of hydrochloric acid, neutralising the filtered solution with magnesia, evaporating to dryness, and extracting the residue with warm alcohol.

From the expressed juice of the fruit of the same plant the authors have obtained a crystalline constituent analogous to cynauchole, from *Cynanchum acutum*, and to asclepion, from *Asclepia Syriaca*. This body fuses at 168°C. , is insoluble in water, but soluble in ether, petroleum, benzine, and mineral acids, and corresponds to the formula $\text{C}_{14}\text{H}_{22}\text{O}$.

Aristolochia Indica. W. Dymock and C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xxii. 245-246.) The authors give the result of a preliminary examination of the roots and stems of *Aristolochia indica*, from which it appears that this drug contains a yellow, amorphous acid, forming a deep orange-red solution with alkalis. Ether, chloroform, and amylic alcohol extracted alkaloidal principles, but it remains yet to be shown whether the three bases obtained by means of these solvents are identical or different.

Constituents of Aristolochia Argentina. O. Hesse. (*Journ. Chem. Soc.*, from *Pharm. Journ.*, 3rd series, xxii. 551.) The root of *Aristolochia Argentina* is treated with ether and then with alcohol; on evaporation, the alcoholic extract yields a resinous mass partly soluble in solution of sodium hydrate, and giving up to ether a base, for which the author proposes the name *aristine*. This base dissolves in hot glacial acetic acid, and, on cooling, crystallises out in gold-coloured laminæ and needles. It is sparingly soluble in hot alcohol, but more soluble in ether, chloroform,

and benzene. It decomposes when heated to 260°. Concentrated sulphuric acid turns the acetic anhydride solution first blue, then greenish-blue. Its alcoholic solution is neutral, but forms red compounds with ammonia and with soda. The author mentions another base from the same source, for which he suggests the name *aristolochine*, although the name has already been applied by Chevallier to a substance obtained from *Aristolochia serpentaria*. *Aristolochine* is precipitated from its acid solutions by caustic alkalies, and is soluble in alcohol, ether, chloroform, and benzene, which, on evaporation, leave it as a colourless, resinous mass.

Cynoglossum Officinale and Heliotropum Europæum. F. Schlagdenhauffen and E. Reeb. (*Pharm. Post.*, xxv. 1.) From the roots and seeds of these two plants of borage order the authors have extracted a toxic alkaloid, which they propose to name *cynoglossine*. This principle does not seem to be present in the leaves or stalks. The roots also yielded a characteristic red colouring matter, resembling that contained in alkanet root.

Ceratantthera Beaumetzi, a new Vermifuge. E. Heckel. (*Bull. Gén. Thérap.*, October 15th, 1891, 336. From *Pharm. Journ.*) The author directs attention to a Scitamineous plant, which he has named *Ceratantthera Beaumetzi*, and which, under the names "dadigogo" and "balancofoana," is employed on the West Coast of Africa as a tæniifuge and purgative. The part used is the fresh rhizome, from which Schlagdenhauffen has separated a resinous substance, soluble in ether and petroleum, and an essential oil. The resinous extract administered in doses of 1·20 gram acted only as a purge. On the other hand, 20 drops of the essential oil, given in a gelatine capsule, followed by a dose of castor oil, caused the complete expulsion of the tænia. This result is supposed to explain a previous want of success by Dr. Beaumetz, when using the rhizome in a dried condition.

Constituents of Podophyllum Rhizome. R. Kürsten. (*Archiv der Pharm.*, cexxix. 220-248.) The active amorphous constituent of podophyllum isolated and described by Podwyssotzki under the name of podophyllotoxin was found by the author to be an impure body, varying in its composition and melting point. But he obtained from it a pure crystallizable principle of marked physiological activity, which he has now also succeeded in preparing direct from the rhizome by extraction with chloroform and treatment of the residue left after evaporation of the chloroform with benzene. In this manner he obtained a yield of 0·2 per cent. of pure *podophyllotoxin*, in the form of prismatic crystals melting at

94° C., and having a composition represented by the formula $C_{23}H_{24}O_9 + 2H_2O$. They are only very slightly soluble in cold water, ether, and cold benzene, easily soluble in acetone and strong alcohol, and with difficulty in strong acetic acid. The alcoholic solution is strongly laevorotatory. When moistened with concentrated sulphuric acid, the crystals give an immediate cherry-red coloration, which slowly passes through greenish-blue to violet. Concentrated hydrochloric and nitric acids produce a red coloration; ferric chloride and bromine produce no change. A solution in glacial acetic acid gives a red coloration with Millon's reagent.

Podophyllotoxin appears to contain three methoxyl groups, but no hydroxyl. The main product obtained in the oxidation of its alkaline solution by means of potassium permanganate is *podophyllic acid*, $C_{20}H_{24}O_9$, an inert crystallizable body fusing at 159° C.

Picropodophyllin, obtained from podophyllotoxin by heating the alcoholic solution with ammonia, has the same composition as podophyllotoxin, but a much higher melting point (227° C.), and is optically inactive. It is indifferent to Millon's reagent, and much less soluble than podophyllotoxin in most solvents. By oxidation and reduction the two compounds yield the same products.

The residue of the chloroform extract, freed from podophyllotoxin, yielded a small quantity of Podwyssotzki's *picropodophyllic acid*, which after purification was obtained in crystals melting at 157° C.

The author also confirms Podwyssotzki's statement as to the occurrence in podophyllum rhizome of a crystalline colouring matter named by the former *podophylloquercetin*. He assigns to it the formula $C_{23}H_{16}O_{10}$, but does not consider it as identical with quercetin. After extraction of the rhizome with petroleum, ether, and chloroform, it is obtained from the residue by treatment with ether.

False Pellitory Root. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 405.) The author furnishes a description of a false pellitory root met with in the London market, which he has been able to identify as the root of *Corrigiola telephiifolia*. It closely resembles pellitory in general appearance, but may be distinguished by the following features:—

The apex of the spurious root is generally crowned with small wart-like protuberances, such as frequently occur in senega root and in many of the *Caryophyllaceæ*; these are the remains of the bases of slightly woody, slender stems. The transverse section of

the root is of a yellowish-white colour, with three to five pale opaque concentric rings, each one alternating with a darker and narrower translucent horny ring.

The taste is sweetish at first, leaving, after a time, a slight tingling sensation, which recalls that of senega. The root possesses scarcely any odour. It is softer and more flexible than pellitory root.

In the root of *Anacyclus Pyrethrum* the structure is quite different. The apex of the root is generally crowned with a tuft of short white hairs. The transverse section exhibits a single ring of radiating linear vascular bundles, which appears porous and of a yellowish colour, the medullary rays and inner portion of the bark being of a creamy-white tint, becoming much darker or of a pale brown hue in badly dried pieces. Scattered over the surface, but much more abundantly towards the circumference of the section, may be seen yellowish-brown oil receptacles, containing the odorous and resinous matters of the root.

Wood-cut illustrations of the two roots and their transverse sections will be found in the original article.

A Spurious White Hellebore Root. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 877.) The root described in this paper had the conical shape of *Veratrum album*, and like it was evidently of monocotyledonous structure. But it was only half the size of the root of *Veratrum album*, and the scaly remains of the leaf-bases that form a characteristic feature in the root of that plant were not present. The taste was slightly aromatic, and an examination of a section of the root revealed the fact that the starch presented the obovate shape and flattened character of the starches of the Scitamineæ. An inquiry as to its geographical source resulted in the information that it came from Africa, probably from the West Coast.

The Value of Unofficial Parts of Ipecacuanha. D. Hooper. (*Pharm. Journ.*, 3rd series, xxii. 591.) Flückiger has stated that the seeds of ipecacuanha are devoid of emetine, and has suggested that the leaves, if procurable, should be examined for alkaloid. The author obtained from Nilambur six plants of two and a half years of age, agreeing with the description of the cultivated variety of *Cephaelis Ipecacuanha*, defined by Balfour. The six plants when dried in the sun yielded:—

Root	21 grams.
Stem	8 "
Leaves	4.8 "

These were reduced to fine powder, and a sample of each was examined separately, according to the following process. The powder was exhausted with warm alcohol, the percolate evaporated to dryness on a water-bath, water added to the dried extract and acidulated with diluted sulphuric acid. After filtering and washing with water, the clear liquor was treated with some freshly prepared Mayer's solution, 1 c.c. of which corresponds with 0.0189 gram of emetine, until a precipitate ceased to be formed. The results of this analysis were as follows:—

Root contained 1.79 per cent. of alkaloid.					
Stems	„	1.13	„	„	„
Leaves	„	1.45	„	„	„

The alkaloid was examined qualitatively; that separated from the stems and leaves had the same appearance and characters as that from the root, and was doubtless emetine.

The leaves and stems of ipecacuanha are thus shown to contain a good proportion of emetine, but, in the author's opinion, they are not likely to displace the root from its position in the Pharmacopœias and in commerce.

The Assay of Ipecacuanha. C. R. R. Beck. (*Pharm. Review*, 1892.) The author prefers a mixture of three volumes of chloroform and one volume of alcohol to other menstrua for the extraction of emetine in the assay of ipecacuanha root. Comparing the relative value of several menstrua, he obtained the following as the mean results of a number of experiments:—

Menstruum.	Average Yield.
Ammoniated Chloroform . . .	2.85 per cent.
Chloroform (plain) . . .	3.10 „
Chloroform, 3 vols. } . . .	3.20 „
Alcohol, 1 vol. }	

Constituents of Trillium. V. I. Reid. (*Amer. Journ. Pharm.*, February, 1892.) Trillium, or beth-root, birth-root, and wake-robin, as it is called, is an herbaceous plant belonging to the natural order of *Liliaceæ*, and is indigenous to the United States, being found in damp woods. The rhizome is the part of the plant employed medicinally, and is sub-globular or obconical in shape, about $1\frac{1}{2}$ inches long, and from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in thickness; it is annulate, of an orange-brown colour, and has numerous light-brown rootlets. Upon transverse section the rhizome presents a mealy appearance, with the fibro-vascular bundles arranged in a circle or wavy line near the circumference. When moistened

with tincture of iodine, it turns to a dark-blue colour. It is inodorous, the taste astringent and bitter.

Its medicinal properties are emmenagogue and emetic. The American aborigines used this plant, and it has been employed as a poultice for tumours and ulcers in domestic practice. Boiled with milk, it is said to be beneficial in the treatment of diarrhœa and dysentery.

The author's analysis shows that in addition to the usual plant constituents, such as starch, tannin, fat, resin and gum, trillium contains a small quantity of fixed oil, saponin to the extent of 4.86 per cent., and an acid crystalline principle which is coloured purplish brown by sulphuric acid, and light green with sulphuric acid and a crystal of potassium bichromate. It is suggested that this acid principle results from a decomposition of the saponin.

Constituents of *Berberis Aquifolium* and *Berberis Vulgaris*. C. Rüdel. (*Archiv der Pharm.*, cxxix. 631-666; *Journ. Chem. Soc.*, May, 1892.) The publications of Wacker, of Hesse, and of Stubbe, on the alkaloids of the roots of *Berberis vulgaris*, and those of Parsons, of Jungk, and of Stubbe on the alkaloids of the roots of *Berberis aquifolium*, show that each contains three alkaloids, and that they are in all probability the same. The chemical formula and the exact description of the salts were not, however, very perfectly defined, and the author has endeavoured to complete this part of the work.

The ground-up roots were in each case extracted with very dilute acetic acid, and the extract was then concentrated to a syrup. Oxyacanthine was precipitated by sodium sulphate, berberine as acetoneberberine (Gaze's method), and berbamine by the addition of sodium nitrate.

The author's analyses show the formula of oxyacanthine to be $C_{19}H_{21}NO_3$, that of berbamine, $C_{18}H_{19}NO_3$, and that of berberine, $C_{20}H_{17}NO_4$. A description of these bases and their salts will be found in the original paper.

Poisonous Constituents of Species of *Amaryllis*. K. Fragner. (*Pharm. Post*, 1891, 421.) The author finds that the bulbs of *Amaryllis formosissima*, which is indigenous to South America, contain a new alkaloid, for which he proposes the name *amarylline*. It crystallises from alcohol in aggregates of short needles, is slightly soluble in water, readily in chloroform and ether. It gives precipitates with the usual alkaloidal reagents, and shows a characteristic reaction with sulphuric acid, giving a reddish-brown solution, which passes after a long time into brown, and becomes

green on addition of a little water. The alkaloid becomes yellow at 190° , brown at 194° , and melts completely at 196° .

Another alkaloid, which the author terms *bellamarine*, may be obtained from the bulbs of *Amaryllis belladonna*, and crystallises in colourless needles, readily soluble in chloroform, alcohol, and ether. It becomes yellow at 175° , brown at 179° , and melts at 181° . With sulphuric acid, it gives a grey coloration, which becomes a beautiful red on warming, and yellowish-green on addition of a grain of potassium nitrate. With sulphuric acid and a little potassium dichromate, it gives first a yellowish-green and then a brown coloration.

Hygrophila Spinosa. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xxii. 1070.) The author confirms the presence in the roots of this plant of a cholesterol, producing a characteristic violet coloration with ferric chloride in the presence of hydrochloric acid. Its composition is found to correspond to the formula $C_{26}H_{44}O$.

The Root Bark of Celastrus Scandens. J. Hoch. (*Amer. Journ. Pharm.*, November, 1891.) The root bark was collected for analysis by the author in Montgomery County, Pennsylvania. His results indicate the absence of any alkaloid or glucoside. The organic constituents found were an orange-red colouring matter, several resins, tannin, a vegetable acid, glucose, and starch.

Ephedra Vulgaris. Dr. Betchine. (*Amer. Journ. Pharm.*, April, 1892.) *Ephedra vulgaris* is esteemed in Russia as a popular anti-rheumatic remedy. The author has found the bark and the root efficacious in acute articular rheumatism with high fever, but in chronic rheumatism not accompanied by fever only temporary relief could be observed.

A report on the active principle of this drug will be found in *Year-Book of Pharmacy*, 1890, 66.

Constituents of Angostura Bark. H. Beckurts and P. Nehring. (*Archiv der Pharm.*, ccxxix. 591-617; *Journ. Chem. Soc.*, May, 1892, 642-644.) 30 kilos. of the coarsely powdered bark were extracted with 75 kilos. of ether; most of the ether was then distilled off, and the brown residue extracted with dilute sulphuric acid. Wax and essential oils were thus separated from the alkaloids, and, in addition, a greenish-yellow crystalline substance was precipitated; it is the salt of a base or bases, but it could not be obtained pure.

From the acid solution four alkaloids were separated; namely, *galipine*, $C_{20}H_{21}NO_3$, *galipidine*, $C_{19}H_{19}NO_3$, *cusparine*, $C_{20}H_{19}NO_3$,

and *cusparidine*, $C_{19}H_{17}NO_3$. These four alkaloids are tertiary bases; their properties and reactions are described in the original paper.

The *essential oil* of angostura bark, which was extracted by means of ether, was freed from alkaloids by dilute sulphuric acid, and then remained as a dark-coloured liquid. From 100 kilos. of the bark, 1.5 kilos. of the oil was obtained. It has an aromatic odour: the sp. gr. at 15° is 0.956, and it dissolves in ether, alcohol, chloroform, light petroleum, and glacial acetic acid; it reddens litmus. It is free from sulphur and nitrogen, and does not react either as a phenol, a ketone, or an aldehyde. Distilled under a pressure of 35 mm., it commences to boil at 153° ; the greater part distilled between 200° and 220° ; the last portions became solid when cooled with a mixture of sodium sulphate and hydrochloric acid.

The *bitter principle*, *angosturin*, is insoluble in ether, but soluble in alcohol, and is found therefore in the alcoholic extract of the bark; it is obtained free from alkaloids after the alcoholic extract has been rendered alkaline with sodium carbonate and extracted with ether. The bitter principle is difficult to obtain pure. The residue, after separating the alkaloids, was dissolved in water, and an excess of tannin added; the precipitate was washed with water, and dissolved in alcohol; lead acetate was added, and the precipitate first washed with alcohol and then with boiling water. The angosturin was further purified by dissolving it in water, precipitating with charcoal, extracting with alcohol, and finally evaporating the latter. It remained as a transparent, pale-yellow mass, which is soluble in water, alcohol, and glacial acetic acid. The addition of ether to the solution in acetic acid precipitated the angosturin quite white; it melts at 58° .

The angostura bark contains a *glucoside*, which may be separated from the bark, after exhausting it first with ether, and then with alcohol, by extraction with water. The solution fluoresces and reduces Fehling's and other metallic solutions. The glucoside was not, however, obtained pure.

Constituents of the Bark of *Populus Alba*. M. F. Schaak. (*Amer. Journ. Pharm.*, May, 1892.) The author's analysis of this bark confirms the presence in it of *salicin* and *populin*. In addition to these it contains the usual plant constituents and nearly 5 per cent. of calcium oxalate.

Valuable *Cinchona* Barks from New Granada. E. M. Holmes. (*Chemist and Druggist*, April 23rd, 1892.) The nine specimens of

cinchona barks reported upon by the author were obtained from Mr. R. Thomson, of Colombia, who discovered some of them in the central range of the Colombian Andes, while others were cultivated by him on his own plantation. Analyses of these samples by Mr. D. Howard show the following composition:—

	Sulphate of Quinine p. c.	Quinine p. c.	Cinchonidine p. c.	Cinchonine p. c.	Quinidine p. c.	Amorphous p. c.
Thomsoniana	5.94	4.45	0.27	0.82	0.26	0.74
Ledgeriana Verde	4.90	3.68	0.00	0.01	0.20	0.41
Negra	7.30	5.48	0.00	0.10	trace	0.78
Morada	3.06	2.30	0.00	0.01	0.50	0.33
Tuna	9.04	6.78	0.40	0.38	0.18	0.42
Pombiano	5.88	4.41	0.34	0.02	trace	0.26
Officinalis	6.32	4.74	1.23	0.10	0.07	0.42
Succirubra	5.93	4.45	2.77	0.12	0.02	0.36
Hybrid β	3.32	2.49	1.92	0.04	trace	0.52

The three last-named kinds are well-known varieties, and not natives of Colombia, any more than the Ledgeriana Verde and Morada. The tree yielding the bark marked "Negra" was discovered by Mr. Thomson in 1883. It grows at an altitude of 8,000 feet, attains maturity with singular rapidity, resembling, in this respect, the Succirubra variety, and is exceedingly rare. The microscopical structure of the *Negra* bark indicates a relationship to that of *Lancifolia*. It received the name of "Negra" (black) because of its deep, claret-coloured petioles, by which the peons are able to distinguish it from other kinds. In the Tuna bark, the richest of these nine varieties, the resemblance to the Ledger species is very evident. Like all other kinds belonging to the *Lancifolia* group, the bark of this species contains numerous stone cells, fairly well distinguishable under the microscope; in the soft or middle layer there are no stone cells; in the other layers the cells are now arranged in solitary lines, now in clusters. The Pombiana variety was discovered in 1883 in Ecuador by a gentleman living in that country, and whose name had been given to it. Several thousand plants have been raised by Mr. Thomson from seeds and cuttings, but the tree is one of very slow growth. The *Pombiana* does not in histological structure resemble any of the cinchonas, but is like the myrtaceous plants. It is regarded as forming a link between *C. pitayensis* and *C. Lancifolia*.

Magnolia Grandiflora. B. A. Randolph. (*Amer. Journ. Pharm.*, September, 1891.) The habitat of this species is Florida, Louisiana, and Texas, although it is found as far north as Tennessee and as far west as California. It thrives best in sandy soil along the banks of rivers, and is seldom found elsewhere. Its spreading branches appear on the trunk at about twenty feet from the ground. It does not bear fruit until it is about five years old. The leaves are alternate, oval obovate, dark green above, with a prominent mid-rib and an entire margin. The under surface has a light-brown colour and velvety appearance. When bruised they have a disagreeable odour and a bitter and acrid and pungent taste, which properties are lost when the leaf becomes dry. By placing a linen cloth on the under surface of the leaf, and marking with a blunt instrument, an indelible rust-coloured mark is obtained. The flowers terminate the young branches and appear in the spring, the buds being covered with two deciduous tough hairy scales. The petals are large oval or obovate, abruptly narrowed at the base, coriaceous and of a brilliant white colour, but becoming instantly rust-coloured when bruised. The stamens are very numerous and much shorter than the corolla. The fruit is about three to four inches long, and two to three inches wide, conical, composed of numerous dehiscent carpels arranged in a sort of imbricated spike; each carpel contains one or two seeds, which after dehiscence remain suspended by slender threads. They are the size of a pea and covered with scarlet pulp, the centre being a hard kernel, white externally and dark-coloured internally. The taste of the fleshy portion is exceedingly pungent, acrid and bitter, and when a ripe seed is bruised in the mouth the irritation often extends far back into the throat, causing a lasting, disagreeable taste, followed by incessant and painful coughing. The gathered seeds become rancid on exposure to air and lose their germinating power.

The bark is about half an inch thick, and breaks with a short fibrous fracture; externally it is of a grey colour, and smooth, often covered with moss; the inner surface whitish, or after drying yellowish or pale-brownish, smooth and very finely closely striate. The dry bark has scarcely any odour and a slight bitterish taste, but the fresh bark has a strong aromatic odour and bitter, acrid, and astringent taste.

It is used as an infusion or decoction for the treatment of rheumatism and malaria, and the tincture made by macerating the bark in brandy or whisky is said to have proved efficient in febrile conditions where quinine had failed.

The bark contains a volatile oil, tannin, starch, glucose, colouring matters, and yields $6\frac{1}{2}$ per cent. of ash.

Ceanothus Americanus. F. C. Gerlach. (*Amer. Journ. Pharm.*, July, 1891.) *Ceanothus americanus* is a shrubby plant indigenous to the greater part of North America, growing in pine barrens and dry woodlands. It belongs to the natural order *Rhamnaceæ*. The root is astringent, and was applied locally by the Cherokee Indians in gonorrhœa and cancer, and given internally in syphilis. A decoction of the leaves and seeds has been used in ulceration of the mouth and throat, and internally in dysentery. These properties are chiefly due to the presence of tannin.

The author has determined the tannin in the root bark, and found it to amount to 6·5 per cent. He has also isolated from it 0·5 per cent. of a bitter alkaloid which he describes under the name of *ceanothine*.

An approximate analysis of the root of the same plant has been carried out by J. E. Hitchcock. His results are described in *Amer. Journ. Pharm.*, September, 1891, p. 430.

The same journal (p. 428) also contains the report of an analysis of the *leaves* of this plant by J. H. Buckner, showing the tannin in these to amount to 9·5 per cent., associated with a colouring matter similar to quercitrin. No alkaloid could be detected in the leaves.

Gum Barks. D. Hooper. (*Pharm. Journ.*, 3rd series, xxii. 573-574.) Gum bark, or *Pishin-puttai* of the Tamils, does not refer to the bark of a tree which exudes a gum by bruising or incision, but denotes a bark which has such mucilaginous properties that it could be used for special purposes in medicine and the arts, where the white of egg would be used elsewhere. Barks of this description occur in the natural orders *Malvaceæ* and *Laurineæ*. A typical gum bark of the East is that of *Kydia calycina*, a malvaceous tree, growing extensively on the slopes of the Nilgiris, and largely employed in sugar refinery under the Tamil name of *Kadularangy-puttai*. On soaking a portion of this dried bark in water it rapidly swells, and the inside becomes coated with a slimy mucilage. The inner layers of the liber may then be removed like pieces of lace, and the gum is seen to be occupying the spaces between the longitudinally disposed fibres, apparently formed from the cellulose of the broken cell-walls. The bark of *Kydia* is sold in the bazaars, and the decoction is

taken as an astringent and tonic, and the Vythians or native doctors consider it to be a specific for diabetes.

Dr. Mohideen Sheriff, in the "Supplement to the Pharmacopœia of India," gives *Tetranthera Roxburghii* as the botanical origin of *Pishin-puttai*, but offers no description of the drug under that heading. Some time ago Mr. Hollingsworth, of the Madras Medical College, supplied the author with an authentic specimen of the bark of *Tetranthera laurifolia*, or as it is now called in the "Flora of British India," *Litsæa sebifera*. The bark was of a reddish-brown colour and slightly balsamic odour, very different to that of cassia or cinnamon. The thickness was a quarter of an inch, and when soaked in water it became very mucilaginous. It afforded, on analysis, distinct reactions for an alkaloid, which had the characters of laurotetanine, a poisonous base discovered by Dr. Greshoff in the barks of several species of Javanese lauraceous plants.

A few years ago a collection of drugs for identification was sent to the author by Dr. P. S. Mootooswamy, of Tanjore, and among them was a specimen of *Pishin-puttai*, which was said to be collected from trees growing in the jungles near Point Calimere. This bark had a most agreeable odour, resembling, but not identical with, Indian cassia, and the taste was decidedly sweet. It made a slimy mucilage when mixed with water and contained some tannic acid, but no alkaloid resembling laurotetanine could be separated from it. The bark is sold in the bazaars, and it is known as *Mydalakady* among Muhammadans. It is used in medicine for its mucilaginous, demulcent, and refrigerant properties. By powdering the bark with some benzoin, mixing it into a paste with a little water, and smearing this on reeds, and drying them in the sun, flavouring sticks called *Samboorany-vatha* are made, and are burnt as an incense or perfume. The author has not been able to obtain the botanical source of this particular variety of gum bark, but he is inclined to believe from its odour that it is an arboreous cinnamon.

From Travancore the author has received on different occasions three specimens of gum bark, all varying the one from the other. The first was a thick, red-coloured bark, a commercial article on the western coast, supplied to sugar refiners. The botanical origin could not be ascertained; it differed in physical characters from the barks previously mentioned, and yielded an alkaloid having the reactions of laurotetanine. Probably it was a *Litsæa*. The second description of gum bark was that of *Kydia calycino*.

The third specimen was sent by the Conservator of Forests for Travancore; it was named in Malyalum *Ava-tholi*, and derived, it was supposed, from a species of *Cordia*.

The author has recently examined some samples of gum barks from the Madura district of Southern India, and stated to be used by the hill villagers in increasing the alcoholic strength of sago toddy. The plants yielding these barks were up to this time only known by their vernacular names, but as leaves, flowers, and fruits were also sent, these enabled them to be identified. The request was also made that they should be analysed to ascertain the nature and effect of their use in native spirit manufacture.

The seven specimens of bark were as follows :—

- | | |
|-------------------------|-------------------------------|
| 1. Kadaly-marum . . . | <i>Olea glandulifera</i> . |
| 2. Koppa-marum . . . | <i>Litsea Zeylanica</i> . |
| 3. Karukathan-gundu . . | <i>Hiptage Madablota</i> . |
| 4. Mullu-gundu . . . | <i>Jasminum flexile</i> . |
| 5. Pungala-marum . . . | <i>Ligustrum Roxburghii</i> . |
| 6. Sudala-marum . . . | <i>Litsea wightiana</i> . |
| 7. Kumala-marum . . . | <i>Gmelina arborea</i> . |

The *Olea glandulifera* is a stout, tall tree with white flowers and small black fruit. The bark is of a greyish colour with whitish specks, about $\frac{1}{8}$ of an inch in thickness, breaking with a close granulated fracture, inner surface brown.

The *Litsea Zeylanica* is a moderate-sized tree with yellowish-white flowers and black fruit; the leaves are ribbed and whitish on the under surface. The bark is grey and covered with lichens, smooth, $\frac{1}{8}$ of an inch thick, fracture close, showing white, glistening fibres running through the red substance of the middle and inner layers, brown and smooth internally. The bark gives off a fragrant odour when burning.

The *Hiptage Madablota* is a woody climber, reaching to the tops of trees over 100 feet high. The stems are from half to three quarters of an inch in thickness, and covered with a thin, smooth, reddish-brown bark enclosing a yellowish wood.

The *Jasminum flexile* is also a climber. The stems are about one inch in diameter, very woody and knotted, covered with a light yellowish-brown bark, exfoliating on the surface.

The *Ligustrum Roxburghii* is a stout tree about 50 feet in height. The bark is coloured russet-brown and is a quarter of an inch or more in thickness; fracture close, showing thick white fibres running through the brown middle and inner layers.

The *Litsæa Wightiana* is similar to *L. Zeylanica* in many respects. The bark has a greyish-green epidermis, beneath which is a chocolate-coloured surface; the fracture is short and light-coloured, becoming red or brown by exposure to the air.

The *Gmelina arborea* is a common tree in the plains. The bark is about half an inch thick, with a rugged, black and yellowish-brown surface, middle layer hard and brown, fracture granular, ochreous within.

Some documents accompanying these specimens stated that the barks of these trees were used to "increase the intoxicating effects of sago toddy." The bark is simply placed in the toddy and left there for two or three days. The bark No. 3, it is said, is not so frequently used, as the resulting liquor causes headache when drunk. With reference to No. 7, it was said that a tenth part of it would answer the purpose in the absence of other barks.

Three of the plants belong to the natural order *Oleaceæ*; these are *Olea glandulifera*, *jasminum* and *ligustrum*, and like other plants of this order contain a peculiar bitter principle, soluble in water and alcohol, and a yellow colouring matter called quercetin. Two other barks of the series belong to the same natural family of the laurels, and have a similar composition; these are the *Litsæas*. The *Hiptage* bark contains tannin, and is simply an astringent; and the *Gmelina* belongs to a class of plants distinguished for their bitterness.

The amount of extract dissolved out of the bark by water and alcohol respectively were determined in order to ascertain their relative proportion, as it would seem that in the absence of much resin, the excess of water extract over the spirit extract would indicate mucilaginous matter, and on the barks being placed in the toddy, which in a fresh state is a watery solution of sugar, with some albuminous matter, the extract would dissolve, but as fermentation proceeded, alcohol would be formed and the mucilage would become insoluble and precipitate, carrying down with it the viscid albumen and thus allow the sugar to ferment more rapidly. From the fact that other gum barks besides the *Litsæas*, such as *Kydia calycina* and *Guazuma tomentosa*, are largely used in clarifying sugar, it appears that some such object as this is intended in their employment. The astringent qualities of most of the above-mentioned barks are used for the purpose of forming insoluble compounds with albuminous matter in saccharine solutions; just as hops are used to remove this substance from malt liquor in the ordinary process of brewing beer.

The natives consider these barks a necessary ingredient in making spirit, because they diminish the great sweetness of the toddy sugar, and render the spirit more intoxicating. The first of these phenomena is accounted for by the chemical fact that sugar breaks up during fermentation into two other bodies, alcohol and carbonic acid; and in the second place the barks enable the operator to obtain a larger proportion of alcohol from his toddy than he could get from leaving it to brew without such adjuncts. The analyses of the barks, with the exception of the *Litsæas*, which contain laurotetanine, have revealed no principle of poisonous or intoxicating properties, therefore the idea of their directly communicating a potency to the spirit is not sufficiently established, and, besides, as the spirituous liquor is submitted to distillation afterwards, any fixed alkaloid would be left behind in the retort. Some of the barks are aromatic, and these may be used to flavour the resulting spirit. It is probably a spirit of this kind that Dr. Ainslie refers to under the title of *Puttaicharagum*, or bark-spirit, an alcoholic liquor in which barks of various acacias are used in the manufacture.

False Angustura Bark. W. J. Smythe. (*Amer. Journ. Pharm.*, March, 1892.) The author has determined the proportion of alkaloids in a sample of false angustura (*strychnos*) bark. As a mean of several determinations he found it to amount to 6.1 per cent. Both strychnine and brucine were present. Further research, dealing with the relative proportion of these two bases, is promised.

Spurious Coto Barks. (*Pharm. Journ.*, 3rd series, xxii. 614.) Two spurious coto barks have recently been met with. One of these is astringent, has little pungency, and is thinner than the genuine drug, and is thus easily detected. The other resembles the *Paracoto* bark, but has a different flavour.

Sandal Wood. H. Adrian. (*Journ. de Pharm. et de Chim.*, July 15th, 1891.) We extract the following notes from a translation of the author's report in *Pharm. Journ.*, 3rd series, xxii. 44:—

Formerly three kinds of sandal wood were recognised:

(1) *Red Sandal wood*, from *Pterocarpus santalinus* (Leguminosæ). This wood possesses no medicinal properties, and is used exclusively in dyeing on account of the red colouring matter it contains.

(2) *White* and (3) *Yellow Sandal wood*. The last two kinds are the produce of several trees of the genus *Santalum* (Santalacæ). Certain authors have stated that they represent, one the sap wood and the other the heart wood; but it has long been recognised that

the depth of colour of these woods depends solely upon the species that yields them, and the two sorts are in fact confounded under the same name.

This wood is very hard, of a more or less dark yellow colour, and has a very pronounced aromatic odour. The hard trunk wood is alone sent to Europe, the branches and white wood having no value; the roots are utilized in the country where they are grown in the preparation of essential oil.

Sandal wood came originally from India. The *Santalum album* is still cultivated there in the mountains of Mysore and at Arcot in Madras. The cultivation is protected by the Government, which decides every year the number of trees to be cut down. The seeds of the tree are sown together with capsicum. The latter spring up very quickly, and the young capsicum plants protect the young sandal plants from the fierceness of the sun. They also serve the purpose of providing nourishment, as the young sandal plants, being parasitic, fix themselves upon the roots of the capsicum plants and draw from thence the necessary juices until they have attained a development, when they can nourish themselves directly by the aid of their own roots. When the trees have attained an age of twenty to thirty years they are cut down, and the trunks are freed from white wood and cut into small billets, which are sent to China or Europe. The roots are cut into chips and distilled on the spot by a very primitive process. The two ports of export from India of sandal wood and oil are Bombay and Mangalore.

The actual quantity of sandal wood oil exported from India tends to diminish. It is a strongly coloured oil and always adulterated, probably with castor oil.

Sandal wood is also met with in the Sandwich Islands, where it is yielded by *Santalum Freycinetianum*, and in the Fiji Islands, where the *Santalum Yasi* is found.

In Australia an essential oil is obtained by the distillation of *Fusanus spicatus* and *F. acuminatus*, which is beginning to arrive in the European markets, but which is less odorous, like the wood from which it is obtained.

Lastly, there is received from Venezuela, but in small quantities, an "oil of sandal wood," known as West Indian, and which is indicated in the price currents as "W. I."

The best oil is prepared in Europe, principally in France and England. The billets are reduced to shavings and distilled with water in large apparatus. The oil, being mixed in the wood with

a resinous substance, separates with difficulty, and distils over only after a time, when it is collected in a series of Florentine receivers, where it separates slowly from accompanying water. It is afterwards clarified by paper filtration. In this way is obtained an oleaginous liquid, having a density of about 0.975 (the B.P. indicates 0.960 and the U.S.P. 0.945), lævogyre, neutral to litmus, soluble in alcohol, ether, and chloroform, and nearly insoluble in water. Exposed to the air, oil of sandal wood oxidizes and resinifies; on the other hand, it gives reactions similar to oil of turpentine and other hydrocarbon essential oils.

It is not rare to find this essential oil in commerce mixed with fixed vegetable or mineral oils of far inferior commercial value. This addition is easily detected, for these fixed oils are usually lighter than essential oil of sandal wood, and diminish consequently the density when mixed. Further, if a drop of suspected oil be placed on a piece of unsized paper, any fixed oil present will not volatilize, but leave a permanent stain. A sophistication more difficult to recognise consists in the admixture of essential oil of cedar or copaiba, either made after distillation, or, as is sometimes practised, by distilling the cedar and sandal woods together. In this case it is not easy to detect the fraud, especially upon a brief examination. It can, however, be discovered with the aid of the polarimeter, as the addition of either cedar or copaiba oil to oil of sandal wood diminishes its rotatory power.

Sandal Wood. P. L. Simmonds. (*Pharm. Journ.*, 3rd series, xxii. 65.) The author gives some statistics showing that although the export of sandal oil from India may be declining, the supply of the odoriferous wood from different quarters is increasing. India still appears to be the chief source of the supply, although the bulk is sent to China. The author states that the chief use of this oil in India is at the period of festivals and weddings. It is then distributed largely to the guests as they arrive and sprinkled with profusion in the apartments, not, of course, pure, but mixed with rose and other perfumed oils. In China the powder of sandal wood is supposed to possess sedative and cooling properties, and on that account is prescribed in fever and gonorrhœa. Internally it is given in bilious affections, and externally in prickly heat and cutaneous eruptions. The wood in powder or rubbed up into a paste is used by all Brahmins in the pigments for their distinguishing caste marks.

The author states that besides the species of *Santalum* named by Adrian (preceding abstract), the following also enter into

commerce: *S. austrocaledonicum*, the Emmango wood, *S. cygnosum*, and *S. spicatum*, of Western Australia, furnish scented woods, of which 4,527 tons were exported in 1885.

Santalum Preissianum (*S. acuminatum*) is very rich in oil, which is much sought after in China. The wood in the rasped condition has a peculiar balsamic odour, suggestive of roses. The wood of *Sethia indica* is so fragrant as to be used in Mysore instead of sandal wood. A brown-red wood of Madagascar yields a so-called sandal wood oil, but like the West Indian it is of no practical importance.

Pernambuco Jaborandi. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 875.) The examination of a flowering branch of this jaborandi has enabled the author to determine that the plant is an undescribed species, for which he proposes the name *Pilocarpus Jaborandi*. The plant differs from *P. Selloanus*, to which it is most nearly allied, in having four pairs of leaflets, in the elliptic-oblong shape of the leaflets and their more fleshy consistence, in the veinlets being more prominent on the upper surface, in the slender glabrous pedicels, only three times longer than the leaf buds, in the minute bracts being situated near the apex of the pedicel, in the rose colour of the ovate petals, pedicels, and upper part of rachis, and in the rugose crenate disc. The calyx is pentagonal, not lobed. A fuller description of the plant is promised.

Ilex Paraguayensis. E. Collin. (*Journ. de Pharm. et de Chim.*, October 15th, 1891, 337.) The author gives an account of the histological structure of maté leaves, and shows that the structural details can be well observed in the commercial powder after boiling the latter with a weak solution of alkali. A description of these details illustrated by wood-cuts will be found in the original article.

Aden Senna. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 874; *Chemist and Druggist*, April 3rd, 1892.) The author reports upon a small variety of senna, with hairy leaves, recently offered at the London drug sales. The leaflets correspond exactly in size, shape, and pubescence with those of *Cassia holosericea*. The plant belongs to the same section (*Brachycarpææ*, Bentham) of the large genus *Cassia* as the official senna. For all practical purposes this variety of senna may be easily recognised by the leaves being smaller and more obtuse than Alexandrian senna, and by the remarkable hairiness of the leaves.

Cassia holosericea is a native of Abyssinia and Nubia, extending to Arabia, and eastward as far as Scinde. It is a small

shrubby plant about $1\frac{1}{2}$ feet high, with imparinnate leaves bearing six to nine pairs of oval oblong leaflets, which are shorter and more obtuse than those of *C. acutifolia* and smaller than those of *C. obovata*, differing from both in their oblong outline and in being densely covered with very short hairs. The inflorescence is an axillary raceme. The pods have not the interrupted ridge which characterizes the fruit of *Cassia obovata*, but are smooth like those of *C. acutifolia*. They are, however, smaller than the latter, and hairy.

Combretum Raimbaultii. E. Heckel and F. Schlagdenhauffen. (*Nouveaux Remèdes*, 1891, 229; *Amer. Journ. Pharm.*, December, 1891.) This arborescent plant is indigenous to Western Africa along the coast, where it is known as *kinkeliba*, the leaves being used in hematuric biliary fever, to which the whites and also the natives of those climates are subject. The plant is furthermore used in cases of severe colic and to arrest vomiting, and the fruit in treating purulent ulcers. The leaves, in the form of a decoction (4: 250), are said to be strongly tonic, diuretic, to produce emesis at first, but then to prevent the return of the same, and lastly to call forth a biliary diarrhoea.

Petroleum ether extracts 2.66 per cent. of a yellow wax-like matter; alcoholic extraction yields 27.12 per cent. of substances consisting principally of tannin; inorganic constituents (ash) present, about 3 per cent.

The Coca Plants in Cultivation. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 817.) In this paper the author gives woodcut illustrations and descriptions of the leaves of *Erythroxylon Coca*, *E. coca*, var. *Novo-Granatense*, *E. coca*, var. *Spruceanum*, and *E. coca*, var. *Bolivianum*.

The Commercial Varieties of Coca Leaves. E. M. Holmes. (*Chemist and Druggist*, April 3rd, 1892.) In commerce there are two kinds of leaves, the dark green, strong Bolivian, or Huanoco, and the light green, Peruvian, or Truxillo leaf. A third variety of leaf is that cultivated in the island of Java, which is occasionally met with in the markets, and has the reputation of being a very carefully dried article. About four years ago Mr. Morris, of Kew, in an exhaustive paper on coca, described a variety which he called "*Novogranatense*," which has narrower leaves and is of a paler green colour than the Bolivian leaf, and this is the variety which appears to yield the Java leaf of commerce. With regard to the respective alkaloidal values of the

various leaves, Peruvian and Bolivian leaves yielded cocaine and isotropyl-cocaine in almost equal parts, whereas the Java leaves gave less cocaine than the two former. The author states that while in this country cocaine is generally prepared by purifying the crude base, the Java leaves are all used for the production of this alkaloid in Germany. So far as cocaine-manufacture is concerned, the leaves of the *Erythroxylon Bolivianum* are preferred, and of this variety the pale brown leaves are the best. The leaves of young plants contain more than double the quantity of alkaloid found in the leaves from old shrubs, and moisture causes a considerable loss in the yield of alkaloid. The variety described by Morris tapers at the base, and the flowers have a short stigma. The cultivated Java leaves are not so long as the "Novogranatense" leaf. They are broader in the middle, the flowers have longer stigmata, and the habit is different from that of the others. The brown Bolivian leaf has a more leathery appearance, and the midrib shows a distinct ridge.

Cannabis Indica. H. F. Smith. (*Amer. Journ. Pharm.*, August, 1891.) The author confirms the presence in Indian hemp of the alkaloid isolated by Siebold and Bradbury in 1881, and described by them under the name *cannabinine* (*Year-Book of Pharmacy*, 1881, 453). His mode of isolation is entirely different from that adopted by those chemists, but the product proves to possess the same characters as those ascribed by them to *cannabinine*.

Haplopappus Baylahuen (Hysterionica Baylahuen). H. Kahn. (*Amer. Journ. Pharm.*, August, 1891.) Compare also *Year-Book of Pharmacy*, 1891, 179. This Chilean plant is stated by Dr. Cervello, of Valparaiso, to possess a special action in certain gastro-intestinal diseases, especially chronic hæmorrhages of the lower bowel, flatulent dyspepsia, indigestion, etc., and to be most useful also in the treatment of malarial and chronic dysentery. Dr. H. Gilbert confirms its value as a remedy in chronic diarrhœa. Dr. Baillé refers its medicinal properties to the resin and oil contained in it.

The author's chemical examination of this drug shows that the resin amounts to 21 per cent., and that it appears to be composed of four individual resinous constituents, which he distinguishes by the names Alpha, Beta, Gamma, and Delta resins. The general results of his analysis are embodied in the following summary:—

	Per Cent.
Moisture	2.11
Ash	12.67
Volatile oil	6.65
Resin	21.15
Tannin and organic acids	2.55
Mucilage	1.46
Dextrin	2.62
Albuminoids, colouring matter, etc.	3.47
Na OH extract not precipitated by alcohol	2.22
Na OH extract precipitated by alcohol	1.42
Calcium oxalate	1.43
Parabin	3.40
Cellulose, Lignin, etc.	37.52
Loss	1.33

Plants containing Audromelotoxin. P. C. Plugge. (*Archiv der Pharm.*, 891, 552.) The author has continued his researches on the occurrence of andromedotoxin in plants of the order *Ericaceæ*. This poisonous principle has now been observed in the following plants:—*Kalmia angustifolia*, *Monotropa uniflora*, *Pieris formosa*, *P. ovalifolia*, *Rhododendron Falkoneri*, *R. grande*, *R. barbatum*, *R. fulgens*, *R. cinnabar*, and *R. punicum*. The poison is absent from *Arbutus Andrachne*, *A. canariensis*, *A. integrifolia*, *A. Unedo*, *Arctostaphylos alpina*, *A. glauca*, *Erica arborea*, *Pyrola maculata*, *P. rotundifolia*, *Ledum latifolium*, and *Rhodo. ferrugineum*.

Menyanthes Trifoliata and Erythræa Centaurium. K. Leudrich. (*Archiv der Pharm.*, 1892, 38 and 48.) The author has isolated the bitter principles *menyanthin* and *erythrocentaurin* from the herbs of these two plants respectively. The composition of the former corresponds to the formula $C_{33}H_{50}O_{14}$, that of the latter to $C_9H_{14}O_5$. Under the influence of hydrolyzing agents, the former splits up into an aldehyde- and phenol-like body called *menyanthol*, $C_7H_{11}O_2$, a resinous product and a lævogyre carbohydrate, while *erythrocentaurin* under the same condition yields a dextrogyre carbohydrate. Both principles are amorphous and very bitter, and closely resemble each other in their physical properties, except in their colour, *menyanthin* being yellow and *erythrocentaurin* white.

Notes on some Indian Drugs and Products. T. Stephenson. (*Pharm. Journ.*, 3rd series, xxii. 544.) This paper contains notes on *Agar Agar*, *Areca Nut*, *Andrographis paniculata*, *Incense sticks*, *Aloes Wood*, *Agar Wood*, *Holarrhena antidysenterica*, *Andropogon laniger*, *Withania coagulans*, and a *False Pellitory Root*. For particulars reference should be made to the above source.

Notes on some North American Medicinal Plants. J. M. Maisch. (*Amer. Journ. Pharm.*, July, 1891.) This paper contains notices of the following plants :—*Ligusticum filicinum*, the botanical source of the Colorado cough-root referred to by the author in his previous paper on this subject (*Year-Book of Pharmacy*, 1891, 188); *Sium cicutifolium*; *Cicuta maculata*; *Euphorbia marginata*; *Eupatorium purpureum*; *Hieracium venosum*, *H. Scouleri*, and *H. præaltum*; *Triosteum perfoliatum*; *Ceanothus americanus*; *Helianthemum canadense*; *Lechea major*; *Galium pilosum*; *Trilisa* (*Liatris*) *odoratissima*, and *Tillandsia usneoides*.

For particulars reference should be made to the original paper.

Medicinal Plants of Gambia. (*Kew Bulletin*, November, 1891, 268–275. From *Pharm. Journ.*) The plants referred to in this report were collected by Dr. Brown Lester, of Edinburgh, and identified at Kew. Several of them are used in medicine by the natives, viz., *Argemone mexicana*, for coughs, in the form of an infusion of the leaves; *Waltheria americana*, the leaves being employed as a poultice for boils; *Parinarium macrophyllum*, the powdered bark rubbed over deep-seated pains; *Combretum racemosum*, the young leaves for killing round worms in children; *Oldenlandia senegalensis*, employed as a vermifuge; *Spermacoe globosa*, and *Mitracarpum scabrum*, the dried leaves for healing ulcers, the latter said to be very effectual; *Vernonia senegalensis*, the leaves chewed as an astringent; *Vernonia nigritiana*, the pounded and boiled roots taken as a purgative; *Culotropis procera*, the leaves applied warm for sprains, headaches, and other pains; *Heliotropium indicum*, used in infusion for gonorrhœa; *Phaylophis parviflora*, the leaves used as a hot fomentation over the spleen in ague cake; *Ocymum basilicum*, an infusion of the leaves given in fevers.

Chilian Remedies. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 878.) The remedies included in this report are the following :—

Baylahuen.—*Haplopappus Baylahuen*.

Cepacaballo.—*Acæna splendens*.

Natri.—*Solanum Tomatillo*; also *S. crispum* and *S. Gayanum*.

Paico.—*Chenopodium ambrosioides*.

Panul.—*Ligusticum Panul*.

Sabinella.—*Margyricarpus setosus*.

Te de Burro.—*Eritrichium gnaphalioides*.

For particulars reference should be made to the above source.

Glaucium Corniculatum. J. A. Battandier. (*Comptes Rendus*, cxiv. 1122.) The author has discovered the presence of fumarine

in the leaves of this plant. He regards this observation as an additional argument for the union of the order *Papaveraceæ* with the *Fumariaceæ*.

Cangoura. C. Renson. (*Pharm. Journ.*, 3rd series, xxii. 982-983.) The Cangoura is a large liana or tropical climbing plant, evergreen and woody, which grows on the banks of streams in the warm and humid forests of Salvador. The plant disappears in proportion as the agriculturist destroys the forest. As a general rule it is now but rarely found in its proper habitats, and only on the borders of little watercourses (*quebradas*), among the few trees which man has not thought fit to cut down.

The plant is a tall, evergreen, hard-wooded climber, with thinly scattered leaves. These are without stipules, compound, imparipinnate, opposite; they have three to seven shining, coriaceous leaflets of a very dark green colour, and about six centimetres long by three broad. The flowers are in clusters, hermaphrodite, regular, small and white; having five half-united sepals, five free petals, ten stamens, with the filaments united at the base in a ring surrounding five free ovaries, each of which is surmounted by a style and contains two ovules. The fruit is a capsule measuring eighteen millimetres in length by six in breadth, containing a single seed, and dehiscing by a longitudinal slit. Seed arillate, with straight embryo, and without albumen.

These characters belong to the order *Connaraceæ*. For want of sufficient material the author has not been able to determine the genus. The plant flowers in the spring and autumn, but produces no seeds except after the first flowering. The seed of Cangoura is eleven millimetres long and six broad; it is black, slightly arched on one side, more or less wrinkled on the other, with bluntly pointed extremities, and it is furnished with an aril of a brown colour covering about a fifth of its surface. If fractured it appears green when fresh, brown in the dry state. In consistence it resembles oily seeds and contains an oil of a greenish colour. This constitutes the liquid extract which is the preparation made use of in the author's physiological experiments.

The strange physiological properties of Cangoura seem to be unknown to the few inhabitants acquainted with the plant, though they all know that it is a violent poison. Three circumstances are named by the author as meriting special attention in connection with its mode of action, viz.:—

1. The relatively great length of time which elapses between the moment of its introduction into the organism and that of the

first symptoms of poisoning (with a moderate dose it is three days).

2. The strangeness of its action upon all display of nervous activity, and especially the cerebral disturbances it provokes (the animal appears a prey to furious madness).

3. The total duration of the nervous phenomena (about twenty days).

The author distinguishes between two forms of poisoning; viz., the first or acute form, followed by death, and the second form of poisoning, followed by recovery. The symptoms of both are fully described in the original paper, to which the reader is referred.

Poisonous Constituents of "Timbo." F. Pfaff. (*Archiv der Pharm.* [2], xxix. 31-48.) *Timbo* is the name given in Brazil to several plants, such as *Serjania cuspidata*, *Serjania lethalis*, and *Paullinia pinnata* of the order Sapindacæ, and *Tephrosia toxicaria* and *Physallis heterophylla* of the order Leguminosæ, all of which are used for the purpose of stupefying fish. A decoction of the root is preferred as affording the more powerful poison. To isolate the active principle, an alcoholic extract of the plant was concentrated, washed with water, treated with ether, and the dark-coloured ethereal solution decolorised by means of sodium carbonate and dilute soda solution. After removing the ether and drying over sulphuric acid, solid crude timboïn was obtained, which softened when exposed to the air. A similar product was obtained by precipitating the alcoholic extract with lead acetate, and purifying the filtrate. Further treatment of the crude product with alcohol, light petroleum, and benzene or chloroform at length yielded a hard, yellowish-white, sandy substance, which, under the microscope, clearly indicated crystalline structure. Timboïn, $C_{27}H_{26}O_8$, melts at 83° , is very soluble in ether, alcohol, benzene, glacial acetic acid, toluene, and carbon bisulphide, exceedingly soluble in chloroform; very sparingly soluble in light petroleum, and almost insoluble in water. Its alcoholic solution is not precipitated either by normal or basic lead acetate, iodine solution, or tannin. Its solution in acetic acid or in alcohol gives a white, flocculent precipitate with water; but these solutions give no coloration, either with ferric chloride or potassium chromate. The compound becomes first black and then reddish-brown with concentrated sulphuric acid. Sobieranski considers timboïn to be a chemically neutral, indifferent substance, and a nerve poison of the toxine class. *Anhydrotimboïn*, $C_{27}H_{24}O_7$, was obtained as

slender, coloured, needle-shaped crystals during the refining of the crude timboin. It was also produced directly from timboin by heating the alcoholic solution with hydrochloric acid. This compound melts at 215–216°, and is not poisonous. Light petroleum, boiling at 38–40°, extracted from the crude timboin an oily compound, *timbol*, $C_{20}H_{16}O$, probably also a poisonous compound, occurring chiefly in the stem and branches of the plants.

Pichi (*Fabiana Imbricata*). H. C. Loudenbeck. (*Amer. Journ. Pharm.*, September, 1891.) The author calls attention to discrepancies in the statements of different authors relative to the constituents of this drug, and gives the result of his own examination, from which it appears that pichi contains no alkaloid. He thinks it probable that the impure glucoside has been mistaken for an alkaloid.

The following summary represents the results of his proximate analysis of the leaves and branches of this plant:—

	Per Cent.	Per Cent.
Ash		4.00
Moisture		8.00
Petroleum ether Extract,		
(a) Volatile Oil	2.22	
(b) Wax and Fat	3.24	
(c) Fluorescent Principle and caoutchouc-like body, small amount		5.65
Ethereal Solution,		
(a) Fluorescent Principle (impure) . . . . .	.6	
(b) Light-coloured Resin	2.5	
(c) Neutral Principle and Chlorophyll . . . . .	.14	
(d) Undetermined Substances . . . . .	.7	3.94
Alcoholic Solution,		
(a) Organic Acids (tannin) . . . . .	.78	
(b) Phlobaphene	3.12	
(c) Undetermined Substances (resin, fluorescent principle)	7.22	11.12
Aqueous Solution,		
(a) Dextrin	1.8	
(b) Organic Acids and Allied Substances	7	8.8
Dilute Potash Solution,		
(a) Mucilage	1.55	
(b) Albumen	3.88	
(c) Undetermined Substances	5.07	10.50
Intercellular Tissue, as Cellulose and Lignin		45.04
Loss		3.96
Total		100.00

The fluorescent principle (glucoside) can be extracted in the following manner:—A strong decoction is treated with acetate of lead, the mixture filtered, the filtrate freed from excess of lead by sulphuretted hydrogen, and the re-filtered liquid evaporated to the point of crystallization. The product is purified by dissolving it in hot water and re-crystallizing. Another method consists in the extraction of the drug with dilute alcohol, evaporating, mixing the dry residue with powdered sand, then extracting with hot water, and separating the glucoside from the filtrate by repeated agitation with chloroform. The residue left on evaporation of the chloroform is purified as before by re-crystallization from hot water. Purification with charcoal seems to cause loss by absorption of the glucoside.

This fluorescent glucoside appears to be the bitter principle of the drug, and deserves further study.

Muna Muna. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 878.) The plant described under this name has a high reputation in Ecuador as an emmenagogue and uterine stimulant; and is said to be invariably used, in the form of tea, for mountain sickness. Its greatest reputation, however, is as a cure for sterility. The plant is stated to grow in rocky places on the mountains, where the ledges are nearly bare of soil. On examination it proved to be *Micromeria*. It belongs to the natural order *Labiata*, and has a flavour resembling that of pennyroyal.

Artemisia Absinthium. O. Senger. (*Archiv der Pharm.*, 1892, 94.) From the ethereal extract of this herb the author has extracted the bitter principle, *absinthin*, $C_{15}H_{20}O_4$, which is a pale yellow, amorphous, very bitter glucoside, soluble in water, alcohol, and ether, and fusing at $65^{\circ}C$. When decomposed by boiling with dilute acids it yields dextrose, a volatile oil, and a solid resinous substance belonging to the aromatic series and reacting like an oxyacid.

Cactus Grandiflora as a Cardiac Remedy. P. W. Williams. (*Practitioner*, October, 1891, 266.) The author reports favourably on the value of this remedy in functional disorders of the heart, especially in palpitation arising from reflex irritation in dyspepsia. He employs the drug in the form of a tincture, made by maceration from the fresh stems and flowers and strong alcohol, in the proportion of four ounces to the pint. This tincture is given in doses from 10 to 30 minims. It is stated to produce neither cumulative effects nor gastric disturbance, and to be particularly beneficial

in those conditions in which it is desirable to avoid the use of cardiac remedies of the digitalis class.

Cactus Grandiflora. J. Aulde. (*Therapeutic Gazette*; *Chemist and Druggist*, August 1st, 1891.) The author's observations confirm the usefulness of this drug in cardiac affections, whether functional or organic, and its freedom from cumulative effects. He recommends the fluid extract in doses of 5 to 10 minims. Where the symptoms are accompanied by gastric disturbance, he administers this extract in combination with nux vomica and pancreatin; and in cases of sexual exhaustion, he combines it with nux vomica, damiana, and phosphorus. Patients suffering from exhaustion, with irregular or intermittent pulse, due to the abuse of tobacco, are also found to be greatly benefited by doses of 5 to 10 drops of the fluid extract twice a day; and the same is stated to apply to persons suffering from nervousness through the excessive use of tea.

Eupatorium Rotundifolium. F. C. Shaw. (*Amer. Journ. Pharm.*, May, 1892.) The author has analysed the flowering plant, and has isolated from it a bitter principle possessing the properties of a glucoside.

Gillenia Trifoliata. F. W. White. (*Amer. Journ. Pharm.*, March, 1892.) The author has submitted this drug to a proximate analysis. His results show that the active principle is a glucoside which can be obtained by agitating an aqueous solution of the alcoholic extract with chloroform. The other constituents found by him are those usually discovered in plant analyses.

Shukai. W. Dymock and C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xxii. 552-553.) Shukai is a Persian drug which is sold in all Indian bazaars. It is stated to be useful in palsy, melancholia, and leprosy. In Persia it is said to have a reputation as a remedy for ague. As met with in India, the drug consists of all parts of the plant broken up. The portions of the stem are of a greenish yellow colour, crooked, channelled, with numerous branches springing from the axils of the leaves. Externally they are siliceous, hard, and pubescent; internally full of soft pith. The petioles of the leaves are stem-clasping, the lower ones completely so. The lower leaves are of considerable size, with a triangular midrib, channelled on the upper surface, and short, thick, spinous lobes, which vary much in shape. The fruit is occasionally found mixed with the drug in considerable quantity; it is a woody nut, $\frac{1}{4}$ inch long, formed by the fusing together of the different parts of the perianth and ovary, somewhat tri-

angular in form; at the base are spines formed by the calycine segments, at the apex the perianth forms a number of tooth-like processes. The seed is ovoid, horny, and has a terebinthinate odour.

The author's chemical examination shows the presence of an alkaloid, a glucoside, a characteristic acid principle, and two distinct resins, besides other less important constituents.

Lycopodium Saururus. P. N. Arata and F. Canzoneri. (*Gazz. Chim. Ital.*, xxii. 1. 146-157. From *Journ. Chem. Soc.*) This plant occurs in South America, where it is known as "pillijan." It contains an alkaloid named pillijanine, which has previously only been obtained in an impure state. The authors extract it in the following manner:—A quantity of the fresh plant (25 kilos.) is bruised and boiled with a large quantity of water acidified with tartaric acid. The liquid is filtered and partially evaporated on the water-bath, calcium hydrate added, and the whole evaporated to dryness. The residue is then extracted with boiling alcohol for three days in a reflux apparatus, light petroleum and amyl alcohol being subsequently used to complete the extraction. The liquids used for extraction are mixed and distilled; the residue is dissolved in dilute acetic acid, filtered, and the solution treated with lead acetate, and again filtered. The lead is separated from the filtrate by hydrogen sulphide, and on evaporating the solution, a syrup is obtained, which is dissolved in water and extracted with ether. The aqueous solution is saturated with sodium carbonate and extracted with chloroform. On evaporating the chloroform solution, the alkaloid (15-20 grams) is obtained as a reddish mass, possessing a powerful odour resembling that of coniine. It is further purified by precipitating the aqueous solution of its sulphate with caustic alkali, and extracting with light petroleum. The alkaloid crystallises from the petroleum solution in needles, melting at 64-65°, and has the composition $C_{15}H_{24}N_2O$. Solutions of its salts give yellowish precipitates with auric chloride, potassium dichromate, iodine solution, and bromine-water. Ferric chloride, potassium ferricyanide, and tannin solutions give reddish, green, and whitish precipitates respectively. On distilling pillijanine in a current of hydrogen, a volatile base having the properties of nicotine is obtained; the alkaloid is hence very possibly amyloxy-nicotine, $C_{10}H_{13}N_2 \cdot O C_5H_{11}$. It acts as a powerful poison. A dose of 0.1-0.2 gram of the hydrochloride administered to a dog causes convulsions, violent vomiting, contraction of the pupil of the eye, and finally death.

Comparison of Oleo-Resinous Drugs. C. C. Sherrard. (New Idea; *Chemist and Druggist*, April 9th, 1892.) The author reports the results of an examination of samples of capsicum, cubebs, ginger, lupulin, male fern, and black pepper, carried out for the purpose of ascertaining the percentage of oleo-resins in each case. The oleo-resins were extracted from the powdered drugs by ether of 0.725 specific gravity. After removing most of the solvent at a gentle heat, the residues were further evaporated at about 65° F. until their weights were constant. The results were as follows:—

Capsicum: Four samples; 15.5, 17.4, 18.3, and 18.4 per cent. of oleo-resin.

Cubebs: Nine samples; 16.14, 18.8, 18.8, 21.06, 21.9, 23, 24.7, 24.8, and 24.8 per cent. of oleo-resin.

Ginger: Four samples; 3.85, 4.72, 5.2, and 5.4 per cent. of oleo-resin.

Lupulin: One sample yielded 66.5 per cent. of oleo-resinous extractive.

Male Fern: Two samples of crude rhizome, 9.27 and 9.87 per cent.; and 3 samples peeled, 1.7, 7.26, and 8.9 per cent. of ethereal extractive.

Black Pepper: Two samples; 8.84 and 9.64 per cent. of oleo-resin.

***Anthemis Cotula*.** W. H. Haake. (*Amer. Journ. Pharm.*, August, 1891.) The author's proximate analysis of the flowers of *Anthemis cotula* shows, in addition to the usual plant constituents, the presence of small quantities of a bitter principle, valerianic acid, and a volatile alkaloid. The bitter principle possesses the properties of a glucoside.

***Spiræa Ulmaria*.** A. Schnoegans and J. E. Gerock. (*Journ. der Pharm., Els. Lothr.*, 1892, 3 and 55. From *Amer. Journ. Pharm.*) The dried flowers by distillation yielded salicylic acid, salicyl-aldehyde (chief constituent), methyl salicylate (minute quantity), and an aromatic liquid having the odour of coumarin. The fresh fruit yielded the first three compounds, but here the methyl-salicylate was the chief constituent, and only a minute quantity of the aldehyde was obtainable. The dried roots furnished traces only of aldehyde, but much of the acid, and chiefly methyl-salicylate. From the fresh roots were isolated only traces of aldehyde, much acid, and absolutely no methyl salicylate. Attempts made to isolate these principles by solvents indicate that the flowers contain the acid and traces of methyl salicylate pre-formed, but no aldehyde; the roots, especially the dried, contain

the acid and methyl salicylate and but little aldehyde. The results point to the presence in the flower of a substance which by decomposition yields the aldehyde; treated with ether, cold alcohol, boiling alcohol, water, alcohol and lime, and acidulated alcohol, mere traces of aldehyde were obtainable by distilling these solutions, indicating the difficult solubility of the substance; the insoluble residue distilled with acidulated water gave a distillate which appeared to contain the full quantity of aldehyde. These experiments prove that the aldehyde is produced by the action of a ferment upon one or more substances, since treatment with alcohol and subsequent distillation with water failed to give more than traces of aldehyde (this because the alcohol coagulated the ferment); distillation with acidulated water then effected the decomposition of the substance with production of the aldehyde. An impure substance was obtained from the flowers, which did not reduce Fehling's solution until after boiling with dilute acid; a behaviour indicating the presence of a glucoside which by decomposition produces the aldehyde. Salicin was not found directly or indirectly in the flowers. This investigation also disclosed that the odour of the oil of spiraea ulmaria did not depend upon the presence of salicyl-aldehyde, but upon the presence of methyl salicylate, vanillin and coumarin; of these, only the last mentioned was not positively identified.

Constituents of the Petals of *Gentiana Verna*. G. Goldschmiedt and R. Jahoda. (*Monatshefte*, xii. 479-485. From *Journ. Chem. Soc.*) On evaporation of an alcoholic extract of 1 kilo. of the air-dried petals of *Gentiana verna*, a dark-red, viscid mass, containing solid, greenish-yellow, resinous lumps, is obtained. Water dissolves a reddish-violet colouring matter, dextrose, levulose, and another substance from the product, and leaves the resinous lumps unchanged. The resin dissolves in alcohol, and after treatment with charcoal forms a colourless solution from which three compounds may be separated by fractional crystallisation. That formed in greatest quantity is an amorphous, granular, white powder which melts at 215-219°. Elementary analysis and a determination of its effect in lowering the freezing point of phenol show that it has the formula $C_{30}H_{48}O_3$. It is without action on hydroxylamine and phenylhydrazine, but forms a triacetyl derivative, $C_{30}H_{45}(OAc)_3$, which is readily soluble in cold alcohol and melts at 175-180°, and, consequently, contains three hydroxyl groups, and has been named *gentiol* by the authors. It is readily soluble in hot alcohol, dissolves sparingly in ether and

benzene, is insoluble in potash, and, on oxidation with chromic acid in acetic acid solution, gives a crystalline acid which melts at 127° . The two other fractions are only obtained in small quantity; one is soluble in alcohol, ether, and benzene, crystallises in beautiful white plates, melts at $115-117^{\circ}$, and has the formula $C_{38}H_{64}O_3$; the other is a yellowish powder, which melts at about 240° .

Constituents of the Pollen of *Pinus Sylvestris*. K. Kresling. (*Archiv der Pharm.*, cccxix. 389-425. From *Journ. Chem. Soc.*) The author's chemical examination of the pollen of *Pinus sylvestris* shows the following results:—

Moisture, 8.73 per cent.

Ash, crude ash, 5.51 per cent.; pure ash, 3.0 per cent.

Fat, 11-12 per cent., melting about 40° , and containing: glycerol, 5.24 per cent.; alcohols, chiefly cholesterol and myricyl alcohol, 6.16 per cent.; fatty acids, 87.85 per cent., of which 77.35 per cent. is oleic acid, and 22.65 per cent. solid acids, chiefly palmitic.

Lecithin, 0.895 per cent.

Cane Sugar, 12.75 per cent.

Starch, 7.4 per cent.

Total glucose, obtained by boiling with seminormal acid, 33.1 per cent., which is 11.7 per cent. more than can be accounted for by the cane sugar and starch; this remainder must be derived from the carbo-hydrates of the cell wall.

Cellulose, 19.06 per cent.

Mucilage, 0.196 per cent.

Organic Acids.—Tartaric and malic acids were isolated. Five grams of pollen gave sufficient acid to neutralise 17 c.c. of decinormal sodium hydrate solution.

Nitrogenous Compounds.—Globulin, nucleïn, peptone, albumen, amines, and ammonia (0.094 per cent.) were detected. No peptonising ferments were found. Proteïds, soluble in water and precipitated by tannin, 1.61 per cent. By extraction with dilute hydrochloric acid and sodium hydrate, 1.595 per cent. of proteïds were dissolved and precipitated by tannin. After this extraction there is still 0.681 per cent. of nitrogen, calculated on the original pollen, in the residue, and about half the total of nitrogen, namely, 1.34 per cent., remains in the extract, not being precipitated by tannin. Of bases, there were isolated: xanthine, 0.015 per cent.; guanine, 0.021 per cent.; hypoxanthine, 0.085 per cent.; and a small quantity of a substance rich in nitrogen, vernine.

Two New Adulterants of Saffron. M. Collardot. (*L'Union Pharm.*, July, 1891, 294.) One of these is stated to consist of fine shreds of onions dried and artificially coloured. The other adulterant referred to by the author is powdered paprika, or "sweet cayenne," attached to the styles of the crocus by means of honey.

Assay of Santonica. M. H. Manseau. (*Chem. Centr.*, 1891, ii. 734.) The drug is finely ground, mixed with calcium hydrate, the mass extracted with alcohol, the latter distilled off, and the residue neutralised with hydrochloric acid. The tarry mass is then dissolved in 300 c.c. of alcohol (sp. gr. 0.935), treated with an excess of lead acetate, and the mixture heated for one hour at 60-70°. The precipitate is filtered off, washed with warm alcohol (in which the lead santonate is soluble), the lead precipitated as carbonate by the addition of sodium carbonate, the solution filtered, neutralised with hydrochloric acid, and the santonin weighed on a tared filter.

Physiological Action of Kola Nut. M. M. Monavon and Perroud. (*Lyon médical*, November 15th, 1891; *Amer. Journ. Pharm.*, February, 1892.) Experiments on dogs have led to the following conclusions:—

1. Kola nut is rather an anuretic than a diuretic.
2. The elimination of nitrogenous bodies and phosphates is diminished under the influence of kola nut.
3. The extract has the same action as the powdered nut.
4. Kola red has a slightly marked action on the elimination of nitrogenous bodies or of phosphates; it is similar to that of the powdered nut.
5. Caffeine has an action analogous to that of the powdered kola, but is inferior to this.

6. Kola can be regarded as a moderator of tissue-waste.

Kola Nut as a Diuretic. P. Boa. (*Pharm. Journ.*, 3rd series, xxii. 841.) The author shows that the percentage of caffeine in kola is decidedly less than that contained in tea. The longer duration of the stimulating effects of kola is attributed by him to the presence of a very large proportion of starch and other soluble matter, entangling, as it were, the active principle, so as to render its absorption less rapid than in the case of tea and other substances containing but little starch or albuminoid matter. Occasionally kola is found to be heavy and difficult to digest. The reason of this is found by the author to be due, not to the kola itself, but to admixtures of cocoa and other fatty substances.

Dealing finally with the problem of preparing kola in a palatable form without any admixture of diluent or flavouring, he finds that a palatable beverage may be obtained from pure kola powder by boiling, and suggests the following procedure:—Take about a teaspoonful of kola powder for each breakfast-cupful of water used; mix the powder evenly with a little cold water (if hot water be used for this purpose, the swelling of the starch leads to the formation of lumps); add the remainder of the water, hot or cold, as may be convenient, and boil for five or six minutes in an open pan. Finally pour into a jug or pot, allow a few minutes for settling, and use as required. If any addition be desired, the author suggests a little freshly roasted coffee as yielding a large quantity of flavour from a very small quantity of substance.

The Chemistry of Kola Nut. E. Knebel. (*Apotheker Zeitung*, 1892, 112.) Keckel observed that kola from which the caffeine had been extracted by means of chloroform still retained much of its physiological action, and that the red colouring matter yielded upon heating a supplement of caffeine, the extraction of which appeared to have been prevented by some resinous matter. The author now shows that the red colouring matter contains a glucoside, which by heating with water or dilute acids splits up into caffeine, glucose, and kola-red. He considers it probable, therefore, that in previous analysis the proportion of caffeine found was only that existing in kola in the free state, while the combined caffeine was weighed along with the colouring matter, and was thus overlooked. The glucoside referred to is described by him under the name of *kola-nine*. The decomposition of this glucoside occurs to some extent already in the nuts, where it is brought about by the action of a ferment. It is considered as not improbable that at an early period the nuts may only contain the glucoside, and that during the period of ripening, and again afterwards during the process of drying, the decomposition above referred to takes place partially. Kola-red, when perfectly free from the glucoside, is found to have a composition corresponding to the formula $C_{14}H_{13}(OH)_5$. It is a very unstable body, and judging from its relation to tannin, it is considered as the probable source of the tannic acid found in kola nuts.

Australian Anise. J. H. Maiden. (*Pharm. Journ.*, from "Notes on Australian Economic Botany," 135.) The author reports that the fruit of *Seseli Harveyanum* is locally used in Australia under the name of anise. It grows at an altitude of about 5,000 feet on the Snowy Mountains. In appearance and

flavour the fruits resemble those of Indian fennel rather than anise.

Tari Pods. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 878.) This Indian drug is derived from *Acacia digyna*, and is considered very suitable for tanning purposes, and probably also for the manufacture of ink. It is stated to contain 33 per cent. of tannin, giving a blue-black colour with ferric salts.

Poisonous Properties of Melampyrum. K. Czakó. (*Bot. Centralblatt*, 1892, *Beiheft*, 65.) Experiments on mice and hares have proved that the ripe seeds of *Melampyrum sylvaticum*, *M. arvense*, and several other species produce toxic effects due to the presence of rhinanthine, $C_{29}H_{52}O_{20}$. Melampyrite, $C_{12}H_{14}O_{12}$, another constituent of these seeds, seems to be inert. The plants previous to the period of flowering are harmless, and are found to be free from rhinanthine.

Penghawar-Djambi. M. Barillé. (*Répertoire de Pharm.*, February 10th, 1892.) Penghawar-djambi, the hair-like chaff of *Cibotium Barometz*, is again recommended as a valuable hæmostatic by the author, and considered to be preferable to *paku-kidang*, on account of the fineness of the tubular hairs, the styptic action being purely mechanical. It is very useful in epistaxis, if introduced into the nostril in the form of a tampon.

Cicuta Maculata. R. Glenk. (*Amer. Journ. Pharm.*, July, 1891.) This species is popularly known as water hemlock, musquash root, beaver poison, or spotted cowbane, and grows on the borders of swamps and on the banks of streams, flowering during July and August.

The author's analysis of the fruit affords indications of a volatile alkaloid closely resembling coniine, but its identity with this base could not be proved for want of sufficient material. The other constituents of the fruit were as follows:—

Mucilage	12.90 per cent.
Glucose	6.0
Malic acid	2.70
Ash	6.0
Pectin and albuminoids . . .	8.20
Lignin	6.0
Incrusting matter	4.0
Cellulose, etc.	17.0

Parshia Tridentata. V. Havard and H. Trimble. (*Amer. Journ. Pharm.*, November, 1891; February, 1892.) The genus *Parshia* of the order *Rosaceæ* is characterized by solitary carpels

becoming dry achenes, exserted, conical-pointed, and minutely grooved, and containing a dark-brown seed, oblong-obovate, about three lines long, without albumen.

P. tridentata is a diffusely branched shrub, 3 to 5 feet high, with small fascicled leaves, cuneate-obovate, 3-lobed at the apex, and solitary flowers, terminal on the short branches, the five yellow petals exceeding the calyx lobes. It is common throughout the Rocky Mountain region, covering foot-hills and slopes, from Arizona and New Mexico to the British boundary, and westward to the Sierra Nevada. Between the thin and membranous epidermis of the seed and the opaque yellowish inner coat is a granulated resinous pulp, half a line thick, deep purple in colour, and intensely and persistently bitter. It imparts its bitterness to water and alcohol without discolouring either menstruum, one seed being sufficient to render a tumblerful of water undrinkable. The bitter principle is apparently distinct from the colouring matter.

The dry husk-like coverings of the seeds were submitted to analysis, with the following results:—

Moisture	11.17 per cent.
Ash	2.41 „
Wax and saponifiable fat . . .	6.83 „
Bitter crystalline neutral principle, soluble in ether, and resin . . .	1.43 „
Tannin	21.75 „
Glucose	2.70 „
Red colouring matter, etc. . . .	18.03 „
Mucilage	1.43 „
Bitter substance, soluble in water . . .	2.66 „
Pectin, albuminoids, and extractive	16.43 „
Pararabin, etc.	2.21 „
Starch	4.55 „
Lignin and celluline	8.40 „

Constituents of Pumpkin Seeds. W. E. Miller. (*Amer. Journ. Pharm.*, December, 1891.) The author's analysis shows the presence in these seeds of a large proportion of a dark red fixed oil, and of a resinous substance dissolving in alcohol with a greenish fluorescence. The search for alkaloids and glucosides gave negative results.

Composition of the Fruit of *Solanum Lycopersicum*. N. Passerini. (*Staz. Sper. Agrar.*, xviii. 545-572. From *Journ. Chem. Soc.*, August, 1891.) The fresh fruit of tomatoes consists

of skin (1·3), pulp and juice (96·2), and seeds (2·5 per cent.). The pulp contains two colouring matters—a yellow, amorphous substance, and a red, crystalline substance. They are both insoluble in water, soluble in amyl alcohol, and very soluble in ether, and both are decolorised by chlorine- and bromine-water. The red crystals are almost insoluble in cold alcohol, whilst the yellow compound is very soluble. Hydrochloric acid has no action on either compound.

The sap of the fruit has a sp. gr. = 0·01833 at 15°, and is laevorotatory. It contains a yellow colouring matter, which differs from that of the pulp in being soluble in water, insoluble in alcohol, ether, chloroform, and light petroleum, and in not being decolorised by chlorine-water or bromine-water. The acidity of the sap is due chiefly to citric acid; it contains also a small amount of an alkaloid, which, like the acid, decreases as the fruit ripens.

The following table shows the percentage of dry matter in the skins, the pulp, the sap, and the seeds, as well as the percentage composition of the dry matter in each case.

	Dry Matter.	Organic Matter.	Ash.	Proteids.	Carbohydrates and Fat.
Skins . . .	40·50	99·20	0·80	1·85	97·05
Pulp . . .	6·35	89·56	10·44	15·15	74·41
Sap . . .	2·44	74·52	25·48	21·80	52·72
Seeds . . .	53·70	95·56	4·40	25·40	70·16

The carbohydrates of the skins are chiefly in the form of cellulose.

The numbers in the last column for sap refer to carbohydrates and acids.

The following analyses are given of two samples of the entire fruit, of which No. 1 was unripe and No. 2 ripe. The percentage of dry matter was 93·50 and 91·01 respectively. The numbers show the percentage in the fruit dried at 105°.

	Glucose.	Citric Acid.	Proteids.	Fat and Colouring Matter.	Cellulose.	Ash.
1.	2·68	48·53	11·25	11·73	7·83	8·05
2.	41·54	9·07	11·48	7·02	18·14	12·78

Spurious Cubebs. (*Pharm. Journ.*, 3rd series, xxii. 614.) Recently a good deal of spurious cubebs has appeared in the London market, of the kind characterised by the mace-like odour and which does not give with concentrated sulphuric acid the crimson colours so readily produced by the genuine article. As these fruits occur mixed with the genuine drug, they are with difficulty recognised by the eye, except by the greyer tint and more wrinkled surface, the size of the two being nearly equal.

Adulteration in Linseed and Linseed Oil-Cake. J. Van den Berghe. (*Pharm. Journ.*, 3rd series, xxii. 496, from the *Bulletin of the Belgian Microscopical Society*.) Linseed oil-cake of commerce is frequently adulterated with colza, various kinds of mustard, hempseed, poppy, *Ricinus*, *Arachis*, etc. If the impurity consists of portions of the seed or seed-vessel of the foreign plant, he recommends treating the linseed successively with sulphuric acid (2·5 p.c.), soda (2·5 p.c.), alcohol and ether, and then digesting for some hours in the cold with a concentrated solution of calcium chloride. This makes both the pericarps and the testa of the seeds so transparent that the distinctive characters of the various species can be readily recognised under the microscope. The nutritive reserve substances of linseed are chiefly almond-grains and drops of oil; when, therefore, the oil-cake is pure, iodine solution should not give the blue reaction of starch.

Kamala. F. A. Flückiger. (*Archiv der Pharm.*, 1892, 2.) The author received from Dr. Greshoff, of Java, ripened capsules of the kamala plant, which when air-dried weighed 207·10 grams. From these were obtained 12·74 grams of seeds, 22·66 grams of kamala (containing 3·92 per cent. of moisture), and 171·70 grams of capsule integuments; the kamala therefore amounted to 10·79 per cent., and was found to yield from 1·3 to 1·5 per cent. of ash. The integuments yielded on incineration 4·19 per cent. of ash, so that an admixture of these would not account for the high percentage of ash in commercial kamala. The undesirable parts of the capsule can be so readily separated by sifting, that it is not possible to see how the "method of collecting" can increase the percentage of ash, unless the collector introduces some adulterating agent.

Kamala. M. Caesar and M. Loretz. (*Apoth. Zeitung*, 1891, 495; *Amer. Journ. Pharm.*, November, 1891.) The authors have sifted commercial kamala with the object of separating as far as possible the portions containing much mineral matter. Of the specimens purified during the past two years, the best one gave

percentage results as follows : 55 per cent. of worthless impurities, as dirt, fruit and bark particles;

12, 10, 3, 2, and 18 per cent. of purified kamala, containing 20, 16, 10, 7.5 „ 6 „ ash.

A sample recently submitted to the same treatment yielded 58 per cent. of worthless impurities; and

5, 10, 4, 8, 9, and 4 per cent. of purified kamala, yielding 40, 35, 24, 21, 14, „ 12.5 „ ash.

Report on Commercial Goa Powder. W. Duncan and T. S. Tweedie. (*Pharm. Journ.*, 3rd series, xxii. 543) Ten commercial samples of Goa powder obtained from different sources were examined by the authors. The results are given in the following table. They prove that there is no foundation for the statements that commercial Goa powder as met with at the present time is inferior in quality as compared with the drug originally imported.

Sample.	Chrysarobin per cent.	Moisture per cent.	Insoluble matter per cent.
1	76.90	2.10	21.00
2	55.50	3.00	41.50
3	80.80	2.60	16.60
4	66.60	2.40	31.00
5	81.80	2.20	16.00
6	82.30	2.20	15.50
7	57.20	3.30	39.50
8	70.80	1.20	28.00
9	68.85	2.90	28.25
10	69.10	2.90	28.00
Average	71.00	2.50	26.50

Amanita Pantherina and Boletus Luridus. E. Opitz (*Archiv der Pharm.*, ccxxix. 290-292); also M. Inoko (*Pharm. Post.*, xxiv. 1891, 581). These fungi yield a considerable amount of fatty oil when extracted with ether. After a short time the oil deposits phytosterol crystals; when freed from these, the fatty material has a thick, oily consistence and a dark-brown colour. Half of the mass consists of free fatty acids. Both oils contained oleic and palmitic acids, glycerol, and phytosterol.

Amanita pantherina, when dried, loses a portion of its poisonous activity. A dried sample yielded 0.1 per cent. of alkaloids, consisting of choline, with a little muscarine.

Boletus Edulis and Boletus Aurantiacus. E. Bourquelot. (*Journ. de Pharm.* [5], xxiv. 521-524; *Journ. Chem. Soc.*, April, 1892.) Histologically the tissue of the cap of the fungus is a continuation of that of the foot, and the filaments of which it is composed descend into the hymenophore. In the full-grown and freshly gathered state, the author has shown that *B. edulis* contains trehalose, mannitol, and glucose; whilst *B. aurantiacus* contains trehalose and glucose only. The three portions of the plant indicated above were separately examined, as follows:—Extraction by boiling 90° alcohol, distillation of the solution obtained, concentration of the liquid residue to one-tenth of the weight of the material treated, precipitation of the residue by means of 90° alcohol, filtration after settling, and, finally, evaporation of the filtered liquor to a syrupy consistency. Trehalose and mannitol readily crystallise; they are drained, washed with 90° alcohol, dried, and weighed. The glucose is estimated in the purified mother liquor by means of copper potassium solution. The results are given in the following table:—

	<i>B. aurantiacus.</i>			<i>B. edulis.</i>		
	Treha- lose.	Manni- tol.	Glucose.	Treha- lose.	Manni- tol.	Glucose.
Foot	5.77	6.29	0.31	24.5	0	0.77
Cap	4.06	3.97	0.37	13.8	0	0.71
Hymenophore .	0	0	0	0	0	0
						gram.
						per kilo-gram.

Garcinia Mangostana. P. R. Liechti. (*Archiv der Pharm.*, cccxix. 426-439.) The author gives a full description of his method of isolating mangostin from the rind of *Garcinia mangostana*. The process detailed by him accords fairly well with that previously described by Schmid (Liebig's *Annalen*, xciii. 83). The pure principle forms bright yellow laminar, odourless and tasteless crystals, which fuse at 173° C., and are insoluble in petroleum ether, slightly soluble in benzol, and readily soluble in alcohol, ether, chloroform, glacial acetic acid, carbon bisulphide, and alkalis, yielding yellow solutions. The product obtained by Schmid from gambogic acid (prepared from gamboge) by oxidation with nitric acid is found by the author to be quite different from mangostin.

The present paper concludes with an anatomical description of the rind of *Garcinia mangostana*.

The Resin of Doona Zeylanica. E. Valenta. (*Monatshefte*, xii. 98-106.) This resin has a specific gravity of 1.1362 at 17.5°, and fuses on being strongly heated, at the same time turning brown and emitting a pleasant odour. It burns in the air with a brilliant flame, leaving 0.007 per cent. of ash, consisting of the carbonates of calcium and of the alkalies, with a small quantity of oxide of iron. By successive treatment of the resin with different solvents, three distinct resins may be separated; one of these has acid properties, whilst the other two are neutral substances.

A New Elemi. J. H. Maiden. (*Proc. Roy. Soc., Queensland*, viii. 3; *Pharm. Journ.*, 3rd series, xxiii. 6 and 15.) The author describes an exudation from the *Canarium Muellieri* which resembles elemi in its general chemical characteristics. It is stated to have the consistence and general appearance of honey and a delicious odour, recalling that of lemon, very different to the odour of the official elemi. The lemon odour becomes so prominent when the substance is digested in cold alcohol, that the oleo-resin may almost be classed as a perfume. It consists of a solution of an amorphous resin (73.33 per cent.) in a volatile oil (26.67 per cent.).

This drug is therefore an oleo-resin. It possesses no particular affinities to Manila elemi.

The Oleo-Resin of Ginger. S. J. Riegel. (*Amer. Journ. Pharm.*, November, 1891.) This investigation was undertaken with the object of ascertaining whether some solvent other than ether would satisfactorily extract the therapeutic properties of ginger, and be suitable for the preparation of the oleo-resin. He arrives at the conclusion that Jamaica ginger contains about 5 per cent. of oleo-resin, which is yielded with equal readiness to alcohol, ether, or chloroform, and that alcohol may therefore with advantage be substituted for ether in the extraction of this constituent. East India ginger is stated to give a yield of 8 per cent. In his opinion the oleo-resin represents all the medicinal virtues of the drug. It consists of a thick, viscid liquid, containing all the pungency of the ginger, and a soft, resinous solid free from pungency and odour. The pungent portion is soluble in benzin, but cannot be directly extracted with it from the drug.

The So-called African Copaiba. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxii. 449.) The author reports on two oleo-resins from West Africa, very dissimilar in appearance, owing

probably to a difference in the manipulation of the two samples. He furnishes the following description, in which these samples are referred to as (A) and (B) :—

(A) was light brown in colour, slightly fluorescent, having an aromatic, somewhat piperaceous odour, a specific gravity of 0.987 at 15° C., and on standing deposited a quantity of small crystals. It yielded by distillation with steam 37.9 per cent. of a pale yellow essential oil, which, when dried over chloride of calcium, distilled at 264°–270° C., and had a specific gravity of 0.9173 at 15° C. The oil was readily soluble in petroleum ether and ether (735), less soluble in pure ether (720), and only slightly soluble in rectified spirit and glacial acetic acid. The crystals deposited by the oleo-resin were repeatedly crystallised from petroleum ether, and when pure had a melting point of 124° C., had a faint yellow colour, and were distinctly acid in reaction.

(B) was darker in colour, more markedly fluorescent, possessed an aromatic, piperaceous, but slightly empyreumatic smell, and on standing nearly half its bulk separated as an ill-defined crystalline mass. The specific gravity of the oleo-resin, thoroughly mixed, was 1.002 at 15° C.; but after removal of the deposited mass, the fluid portion had a specific gravity of 0.992 at 15° C. It yielded by distillation with steam 40.2 per cent. of a pale yellow essential oil, boiling from 264°–270° C., and having a specific gravity of 0.9188 at 15° C. The oil was readily soluble in petroleum ether and ether (735), less soluble in pure ether (720), and only slightly soluble in rectified spirit and glacial acetic acid.

The crystals were purified in the same manner as those from (A), and found to have the same melting point (124° C.), and to be distinctly acid. This melting point is somewhat close to that of a crystalline resin obtained by Flückiger from gurjun balsam (m.p. 126°–130° C.), but that body was indifferent, whilst this from the African oleo-resin was markedly acid, distinctly electrical by friction, and appeared to resemble in general characters the oxycopaivic acid (melting point about 120° C.), found by Fehling in a deposit from a *Para copaiba*.

Various tests for gurjun balsam were applied to both samples, but with negative results.

The author arrives at the conclusion that these two African oleo-resins are identical, and that in most particulars they resemble the South American *copaibas* in their general characteristics. A chemical investigation of the crystals and volatile oils obtained from these two African drugs is to follow.

Balsam of Tolu. R. H. Davies. (*Chemist and Druggist*, March 26th, 1892.) The author reports upon a sample of balsam of tolu submitted to him for testing as to its genuineness. The sample, examined under the microscope, showed no crystals of cinnamic acid, which are invariably to be observed in ordinary samples, and it had no characteristics in common with any of the several samples he had obtained from various sources, all of which showed the cinnamic acid crystals. He determined the acidity of the alcoholic solutions of the various samples, with the following results. The genuine samples required for each gram employed 20.7 c.c., 21.0 c.c., 21.1 c.c., 21.2 c.c., and 21.3 c.c. of decinormal solution of soda. The sample of tolu required for 1 gram 26 c.c. of the same solution. The same quantity of ordinary resin required 28 c.c. The last two results thus lie in the same direction.

Urostigma Dolarium. T. Peckolt. (*N. Y. Pharm. Rundsch.*, July, 1891, 166. From *Pharm. Journ.*) The author reports upon the milky juice of *Urostigma dolarium*, or "white fig," a gigantic urticaceous tree, as being used by the natives of Brazil in the treatment of anchylostomosis, which frequently occurs in that country. The milk, which is secreted most abundantly in August, is said to be snow-white, of a creamy consistence, and to have a sweetish taste, resembling almond cream, with a resinous after flavour. The principal action of the milk is attributed to a substance resembling papayotin, and like it possessing the property of digesting fibrin and coagulated albumen, of which it contains about 1.6 per cent. In addition it contains about 5 per cent. of "doliarin," a substance having a weak anthelmintic action. The milky juices of other species of *Urostigma* are also used as popular remedies in Brazil; for instance, that of *U. Maximilianum* as a pigment against aphtha, and that of *U. cystopodum*, given internally as a blood purifier and in syphilis. On the other hand, the juice of *U. hirsutum*, in full doses, is poisonous, and that of *U. atroz* is said to be used in the preparation of the Urari arrow poison.

Proportion of Alkaloids in Opium. H. Adrian. (*Journ. de Pharm. et de Chim.*, 1891, 526.) In an examination of 38 samples of opium the author found the morphine to vary between 6.75 and 12.15 per cent., while the narcotine varied from 0.10 to nearly 4 per cent. The sample with 0.1 per cent. of narcotine contained 10.07 per cent. of morphine, while the one with the highest percentage of narcotine (3.97 per cent.) contained 9.7 per cent. of morphine. The author lays stress upon the importance of a

proper proportion between the two bases, and suggests that opium should be required to contain 10 per cent. of morphine associated with not less than 2·5 per cent. of narcotine.

Assay of Opium. A. Lambert. (*Journ. de Pharm. et de Chim.* [5], xxiii. 593–597.) The author recommends an optical method, the main details of which are as follows:—15 grams of the opium to be tested are treated with 6 grams of slaked lime and 150 c.c. of water added in small portions; after stirring occasionally, the liquid is filtered off at the end of half an hour. To 53 c.c. of the filtrate are added 1 c.c. of acetic acid, 2 c.c. of water, 1 gram of powdered sodium sulphite, and some fragments of zinc. After a quarter of an hour the solution is filtered and examined in the polarimeter: let N be the deviation in degrees. 60 c.c. of the first solution are now actively shaken with 3·5 grams of ammonium chloride during 10 minutes, filtered, and 41 c.c. of the filtrate is treated with 1 c.c. of acetic acid, 0·75 gram of sodium sulphite, and some small fragments of zinc. After a quarter of an hour it is filtered and examined in the polariscope; let n be the deviation, then $N - n$ indicates the quantity of morphine contained in 100 parts of opium.

Assay of Opium. D. B. Dott. (*Pharm. Journ. Trans.* [3], li. 746.) The author points out some sources of possible error in Teschemacher and Smith's gravimetric process of opium assay, and recommends the following method:—10 grams of the opium in powder are exhausted with spirit of '920 sp. gr. One or two drops of solution of ammonium oxalate are added, and then ammonia, until the spirit is only slightly acid. The spirit is now evaporated to one-third of its original volume, allowed to cool, and filtered. The filtrate is concentrated to about 5 c.c., transferred to a small flask, 4 c.c. of water and 3 c.c. of methylated spirit being used to wash the capsule. 2·2 c.c. of solution of ammonia ('960 sp. gr.) are then introduced, 25 c.c. of ether being introduced at the same time. The flask is now closed with a well-fitting cork and shaken so as to mix the contents. After eighteen hours the ether is decanted as completely as possible, the precipitate collected on counterpoised filters, and washed with morphiated water. It is then dried, washed with benzene, dried, and weighed, and finally titrated with $\frac{N}{10}$ sulphuric acid. 1 c.c. of the acid = 0·303 gram of morphine hydrate. Although it is not essential it is preferable to weigh the morphine before titrating, as an idea is thereby given of the amount of acid which will be required. This process is only recommended where the morphine is to be titrated.

If reliance is to be placed on the gravimetric result, preference should be given to the method of Teschemacher and Smith.

Notes on Essential Oils. Schimmel and Co. (*Pharm. Journ.*, 3rd series, xxii. 292 and 328-330.) The present report contains notices of the oils of arnica, betel leaves, cajeput from seven different species of *Melaleuca*, dill, garlic, neroli, rose, rosemary sandal wood, sassafras, spike, wintergreen, golden rod (*Solidago odorata*), catmint (*Nepetaria cataria*), reseda, *Eucalyptus rostrata*, *Eucalyptus alba*, *Andropogon*, Java peppermint, cinnamon leaves, and nutmeg leaves. For particulars reference should be made to the source above mentioned.

Essential Oil of Valerian. J. E. Gerock. (*Journ. der Pharm. v. Els.-Lothr.*, 1892, 85.) The composition of this oil is found by the author to be as follows:—

Terpenes	87.35 per cent.
Borneol valerianate	9.54 ..
Borneol butyrate	1.07 ..
Borneol acetate	0.96 ..
Borneol formate	1.08 ..

Oil of Birch. W. H. Breisch. (*Amer. Journ. Pharm.*, December, 1891.) The yield of this oil is about 1 per cent. of the wood. It is most abundant during the months of July and August. The oil when first distilled is very pale or almost colourless, but on standing a while it becomes very much darker. Occasionally, it is found to be highly coloured, due to traces of iron from the oxidation of the tin worm or the can with which the oil comes in contact. There are three ways of purifying the oil: by decolorization, filtration, and redistillation. The easiest method of purification is stated to consist in putting the oil in a bottle, adding a few crystals of citric acid and agitating occasionally, until the oil is colourless, or nearly so.

Essential Oil of Laurel. J. W. Brühl and F. Müller. (*Ber. der deutsch. chem. Ges.*, xxv. 547-551.) The author confirms the absence of "laurene" in this oil. The specimen examined by him distilled between 175° and 275°, and left a viscous residue. The distillate was found to contain lauric acid, cineole, pinene, and other hydrocarbons. The crude oil also contains large proportions of alcoholic or ketonic compounds.

Oil of Lime Seed. C. Müller. (*Ann. Agron.*, xvii. 431-432; *Journ. Chem. Soc.*, January, 1892.) The seeds of *Tilia phatyphylla*, or *grandifolia*; *T. ulmifolia*, or *parvifolia*; and *T. intermedia*, con-

tain little starch, and about 58 per cent. of oil. It is a yellow, bland oil, resembling the best olive oil, not bitter or aromatic, and non-drying. It does not become rancid, or resinify on exposure to air. Mixed with sulphuric acid, the liquid becomes deep brown-red, and the rise in temperature is considerable. The oil solidifies under the action of nitric acid and mercury. Its soda soap crystallises from alcohol in long yellow needles. The oil does not solidify at -21.5° .

The Purity of Oil of Wintergreen. F. B. Power. (*American Druggist*, January 15th, 1892.) If to 1 c.c. of the oil (gaultheria, birch, or synthetic methyl salicylate) contained in a capacious test-tube, 10 c.c. of a 5 per cent. solution of sodium hydrate be added and the mixture agitated, a bulky, white, crystalline precipitate is produced; and if the tube, loosely corked, be subsequently placed in boiling water for about five minutes with occasional agitation, a clear, colourless, or faintly yellowish solution should be obtained, without the separation of any oily drops either on the surface or at the bottom of the liquid (absence of other essential oils or of petroleum). If the liquid thus obtained be subsequently diluted with about three times its volume of water, and a slight excess of hydrochloric acid added, a white, crystalline precipitate will be produced, which, when collected on a filter, washed with a small amount of water, and recrystallized from hot water, should respond to the tests for identity and purity of salicylic acid (absence of methyl benzoate, etc.). By the use of the above test with various admixtures, the author has satisfied himself that the presence of 5 per cent. of the oils of sassafras or camphor can be easily detected in the oils of gaultheria or birch, not only by the separation of distinct oily drops either at the bottom or on the surface of the liquid, but also by their pronounced odour, since the characteristic odour of wintergreen becomes completely lost. An admixture of 5 per cent. of petroleum could also be easily detected by this test.

Detection of Turkish Oil of Geranium in Oil of Roses. G. Panafotow. (*Ber. der deutsch. chem. Ges.*, xxiv. 2700-2701.) A mixture of these two oils gives a blue coloration on shaking a few drops with a solution of rosaniline previously decolorised with sulphurous anhydride, and then keeping for about two hours. Pure oil of roses gives a red coloration after shaking with the reagent and then keeping for about 24 hours.

The Oils of Cinnamon Leaves and Roots. J. Weber. (*Apoth. Zeitung*, 1891, 522.) Both these oils are found to differ from

the essential oil of cinnamon obtained from the bark. While the latter consists of cinnamic aldehyde and terpene, the oil from the leaves is almost entirely composed of eugenol, with merely a small proportion of terpene and cinnamic aldehyde. The oil of the root contains eugenol, with large quantities of terpene and safrol, and a minute proportion of benzaldehyde.

Essence of Lemon. V. Oliveri. (*Gazz. Chim. Ital.*, xxi. 318-330.) Freshly prepared essence of lemon is a canary-yellow, oily liquid, of a pungent acrid taste. Its sp. gr. is 0.860 at 16°, and its specific rotatory power $[\alpha]_D$ at 16° varies from +69.75° to +75.10°. On distillation it yields three principal fractions, of which the first boils at 170-171° C., and amounts to about one-fifteenth part of the whole. It is a colourless, mobile terpene, $C_{10}H_{16}$ having the characteristic odour of the essence. The second fraction boils between 176° and 178°, and includes nine-tenths of the whole; it is a mobile, colourless liquid having a sp. gr. of 0.8990 at 0° and a specific rotatory power $[\alpha]_D = +76.75^\circ$, and the composition $C_{10}H_{16}$. The third fraction consists of a sesquiterpene, $C_{15}H_{24}$, boiling at 240-242° C., and is a viscous, yellowish liquid which is optically inactive, and has a specific gravity of 0.9347 at 0° C. The proportion of this fraction in the fresh oil is very small.

Essence of Lemon. (From Schimmel and Co.'s Report for April, 1892.) Genuine essence of lemon prepared from the fresh fruit by expression is found to have a specific gravity of 0.858, and an optical rotation of +61° 0'; while the oil prepared from the same fruit by distillation has a specific gravity of 0.856, and an optical rotation of +66° 20'. Of the essence occurring in commerce, by far the greater part is found to be impure.

A New Form of Essence of Lemon. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxii. 876.) The sample reported upon in this paper is one of the so-called "terpene free" oils, which have recently been offered in commerce. The price of this oil was stated to be £10 per lb. A comparison of the sample with one of ordinary essence of lemon from Trinidad shows the following differences:—

	So-called "Terpene-free" Oil.	Oil from Trinidad.
Relative density (15° C.) . . .	.851	.876
Solubility in spirit	1 in 5	1 in 18 (approx.)
Specific rotatory power	+65.8°	+47.2°
Boiling point	About 179°	From 172°-176°

This new essence appears to become more readily altered in flavour by keeping and exposure to air than ordinary oil of lemon. Its chief use seems to consist in the preparation of a soluble essence of lemon for aerated waters, in which, on account of the non-exposure to air, its flavour does not become readily changed.

Citral. (From Schimmel and Co.'s Report for April, 1892.) This constituent of essence of lemon occurring in the latter to the extent of 6 to 8 per cent. is considered to be equal in strength to fourteen times its weight of the essence, and is now said to be extensively used in the place of the latter, or as an addition to it. It forms a clear solution in alcohol of even very moderate strength. It is found to have a specific gravity of 0.8972 at 15° C., to boil at about 226° C., and to be optically inactive. It is considered as identical with geranaldehyde.

Oil of Lavender. (From Schimmel and Co.'s Report for April, 1892.) The principal constituent of this oil is found to consist of an alcohol identical with linalool from the oil of Mexican lignum aloes and its acetic ester. The latter proves also to occur in oil of bergamot to the extent of 40 per cent. The alcohol can be converted by oxidation into geranaldehyde or citral.

Oil of Myrtle. P. Bartolotti. (*Gazzetta*, xxi. 276-282.) The essential oil of myrtle (*Myrtus communis*), when purified by redistillation over calcium chloride, is a colourless, mobile liquid, soluble in alcohol, ether, etc., but only very sparingly so in water. Its rotatory power is $[\alpha]_D = +55.4$; its specific gravity at 27° C. is 0.881.

Eucalyptus Oils and the Species of Eucalyptus yielding them. J. H. Maiden. (*Pharm. Journ. of Australasia*, March 15th, 1892; *Pharm. Journ.*, 3rd series, xxii. 944-946.) The author classifies these oils into three groups:—

1. Scented or Perfume Oils.
2. Mallee Oils.
3. Other Eucalyptus Oils.

These scented or perfume oils bear a strong resemblance to each other in regard to odour. They have been suggested as soap-perfumes, but the chief difficulty in dealing with them arises from their volatility. Their perfume reminds one of citronella oil, although it is much more dainty than this well-known oil. They are the produce of the following species:—

E. Baileyana.

E. dealbata.

E. maculata, var. *citriodora*.

E. Staigeriana.

Mallee Oils.—The word "mallee" is of aboriginal origin, and is applied to those dwarf eucalypti found in arid country, which throw up a number of their stems from one stock. There is more or less of this "mallee scrub" or "mallee country" in the interior of all the colonies. The mallee grows to no great height, but it frequently forms impenetrable belts.

Of the eucalypts forming a mallee, the following are named as the chief :—

E. cneorifolia.
E. dumosa.
E. gracilis.
E. incrassata.
E. oleosa.
E. pyriformis.
E. uncinata.

Most of these mallee-eucalypts yield abundance of very good oil, which has the advantage of approximately constant composition and of being particularly rich in eucalyptol.

Other Eucalyptus Oils.—This class embraces the following species :—

E. amygdalina.
E. globulus.
E. goniacalyx.
E. hæmastoma.
E. mitrocorys.
E. piperita.
E. Planchoniana.
E. populifolia.
E. rudis.
E. salubris.

Short descriptions of all the species named will be found in the original paper.

Eucalyptus Oils of Commerce. E. M. Holmes. (*Chemist and Druggist*, April 23rd, 1892.) The author shows that the great differences in the qualities of commercial oil of eucalyptus date from the time that this oil commenced to be a popular remedy. Within the last few years a new kind has appeared in the market under the name of *E. oleosa*, which has a cumín-like odour, very different from the *oleosa* oil previously met with. The oil formerly known by that name was the Mallee scrub oil, a mixture distilled from four species which grew together, while the new *oleosa* is a distinct variety, obtained from *Eucalyptus cneorifolia*.

Though the original reputation of eucalyptus oil was based on the *Globulus* variety, the *Amygdalina* oil has now been the prevalent one in the market for years, and, together with that of *E. dumosa*, it is still the one preferred for inhaling in lung diseases. The author considers it very desirable that experiments should be made by physiologists, in order to determine whether the properties of eucalyptus oils are due to eucalyptol, phellandrene, or some other constituent. He expresses a hope that for the sake of uniformity in dispensing, a product of definite composition extracted from eucalyptus oil may in the next Pharmacopœia take the place of an oil of unknown and indefinite composition.

Oil of Eucalyptus. W. Lloyd Williams. (*Chemist and Druggist*, March 19th, 1892.) In the course of an examination of a number of samples of eucalyptus oil, one specimen was found in which no deviation in the polarised ray was noticeable after traversing 200 mm. of the oil. It was thought at first that possibly a sample of eucalyptol had been submitted in lieu of a specimen of oil, but further examination speedily showed that this was not the case, and 150 c.c. were fractionated in the usual way. Upon examining these fractions, they were found to possess rotatory power in accordance with the following table:—

No. of Fraction.	Range of B.P.	C. c. Collected.	Observed rotation D ray in 200 mm. tube.
1	Below 170° C.	12	+ 12°
2	170°-172° C.	21	+ 6°
3	172°-174° C.	29	Not determined (lost)
4	174°-179° C.	55	0
5	179°-182° C.	12	— 6°
6	182°-184° C.	9	— 10°
7	Residue.	12	Not determined

As eucalyptol is inactive, the gradual diminution in optical activity up to fraction No. 4 (containing that constituent), and the equally gradual augmentation beyond this fraction, affords striking indications in favour of the assumption that the incompetence of the original oil to deviate the ray was a consequence of the union of oppositely rotating constituents in equally balanced proportions. There was no reason to suppose that the oil had been tampered with. Its specific gravity at 65° F. was .925, its odour good, and the yield of eucalyptol by no means low, as the fraction No. 4 solidified completely when placed in a mixture of ice and salt.

Oil of Pennyroyal (*Mentha Pulegium*). E. Beckmann and M. Pleissner. (*Liebig's Annalen*, cclxii. 1-37; *Journ. Chem. Soc.*, 1891, 936.) Spanish oil of pennyroyal is a light-yellow or green, rather thick liquid, with an odour slightly resembling that of peppermint. On fractional distillation by far the greater part passes over between 212° and 216° ; after this a small proportion of a dark-yellow liquid comes over between 216° and 223° , leaving an equally small quantity of a brownish residue. A compound of the composition $C_{10}H_{16}O$, named by the author *pulegone*, can be isolated from the portion boiling at 212° - 216° by repeated fractional distillation under reduced pressure (60 mm.); it is a colourless liquid, of sp. gr. 0.9323 at 20° , boils at 130 - 131° (60 mm.), and has an odour recalling, but distinct from, that of oil of peppermint. Its specific rotatory power is $[\alpha]_D = 22.89$, but this value is slightly diminished when the oil is treated with sulphuric acid or distilled with steam, probably owing to resinification. Pulegone quickly turns yellow, even when kept in closed vessels, and it does not solidify when cooled in a mixture of ice and salt; it is gradually resinified by hot alcoholic potash, and does not give an ethereal salt with benzoic or stearic anhydride; it gives some, but not all, the reactions of aldehydes, and with phenylhydrazine yields only oily or resinous, very unstable compounds. Determinations of the molecular weight gave results corresponding with the formula $C_{10}H_{16}O$.

The remainder of this paper deals with three derivatives of pulegone; viz., *pulegoneoxime*, $C_{10}H_{19}NO_2$, *pulegoneamine*, $C_{10}H_{19}ON$, and a body of the composition $C_{10}H_{17}BrO$.

Myrtol. (*Amer. Journ. Pharm.*, June, 1892.) Myrtol is that portion of the oil of *Myrtus communis* distilling between 160° and 170° C. It contains cineol identical with cajeputol and eucalyptol and a hydrocarbon $C_{10}H_{16}$. It is used with some success in putrid bronchitis and pulmonary gangrene. It is partially eliminated with the products of respiration, diminishing the odour and at the same time the quantity of the expectorations. As it is also partially eliminated by the kidneys, it is proposed for the treatment of catarrhal affections of the urinary tract. It is used in capsules containing 15-20 centigrams, eight or ten being given during a day, when the patient is without fever. In the treatment of affections of the respiratory tract it may be used hypodermically. The solution used contains 1 part of myrtol to 4 parts of liquid paraffin or oil of sweet almonds. Two injections of 3-5 grams of the solution are given daily.

Assay of Oil of Cloves. H. Thoms. (*Pharm. Centralhalle*, October 8th, 1891; *Pharm. Journ.*, 3rd series, xxii. 450-451.) As the value of oil of cloves depends upon the proportion of eugenol contained in it, the author suggests a process of assay, based on the separation of this constituent in the form of benzoyl-eugenol. This separation is effected by mixing the oil with sodium hydrate, and adding a sufficient quantity of benzoic chloride. Upon cooling, the mixture deposits benzoyl-eugenol in the form of crystals, which are purified by recrystallization from hot alcohol, then washed with cold alcohol, collected and dried on a filter, and weighed. A correction is then made for the solubility of this substance in alcohol of 90 per cent., which amounts to 0.55 gram for every 25 c.c. of alcohol. The corrected weight of benzoyl-eugenol thus ascertained yields the percentage of eugenol in the oil by calculation.

Detection of Oil of Turpentine as an Adulterant in Essence of Lemons. V. Oliveri. (*Gazz. Chim. Ital.*, xxi. 330. From *Journ. Chem. Soc.*) The sophistication of essence of lemons by turpentine oil is difficult to detect, owing to the percentage composition of the two oils being identical, and their boiling points and densities being almost the same.

The author finds that the readiest method of detecting the fraud is to observe the specific rotatory power. As the adulterant most frequently employed is French turpentine oil, having a specific rotatory power of $[\alpha]_D = -27.0^\circ$ about, its presence in lemon oil, having a specific rotation $[\alpha]_D = +60.0^\circ$, is at once betrayed; the amount of the adulterant may be easily calculated, as the rotatory power of the mixture is the algebraic sum of the rotatory powers of its constituents taken in the proportions in which they are present. Even when the adulterant is a dextrorotatory oil, such as Russian or English turpentine, the change in the rotatory power is so great as to at once betray its presence.

The author gives tables for calculating the percentage of the adulterant present from its rotatory power.

Detection of Turpentine as an Adulterant in Essential Oils. L. Crismer. (*Bull. Soc. Chim.* [3], vi. 29-30.) The reagent employed by the author is prepared by neutralizing a hot solution of 20 grams of acid tartrate of potassium with the requisite quantity (5-6 grams) of manganous carbonate, and then adding sufficient water to make up 1 litre. It is applied as follows:—5 c.c. of the essential oil to be tested, 3 c.c. of the reagent, and 5 drops of solution of ammonia (sp. gr. 0.925) are well shaken

together in a test-tube, which is then placed in a water-bath, and a current of air passed through the contents for 30 seconds; the tube is then removed, its contents well shaken, and allowed to separate. With the exception of the oils of lemon and bergamot, which are coloured dark brown, the majority of pure essential oils are but faintly tinged with yellow, whereas the addition of turpentine determines a coloration varying from brown to intense brown-black in the supernatant oil.

Metallic Impurities in Essential Oils. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1891, 790.) The author suggests that essential oils should be kept in glass vessels only, owing to their action on metals. He detected zinc in a sample of sandalwood oil, and lead in 11 samples out of 12 of commercial oil of cassia. One of these samples contained a distinct crystalline sediment consisting of lead cinnamate.

The Fat and Essential Oil of Sabadilla Seeds. E. Opitz. (*Archiv der Pharm.*, 1891, 265.) Good sabadilla seeds, which have not yet undergone any spontaneous change on keeping, give an average yield of 13 per cent. of fat and 0.32 per cent. of volatile oil. The latter, when freshly prepared, appears to be composed of the methyl and ethyl esters of oxymyristic and veratric acids, of several aldehydes of the lower fatty acids, and of polyterpenes with high boiling points. The fat, when completely freed from essential oil by heating with steam, consists of 50 per cent. of oleic acid, 36 per cent. of palmitic acid, 10 per cent. of glycerine, and 4 per cent. of cholesterolin.

The Purity of Castor Oil. H. Gilbert. (*Moniteur Scientifique*, iv., Part 2; *Chem. News*, December 11th, 1891.) Pure castor oil has a specific gravity of 0.950–0.970. It becomes turbid at 0°, with a separation of crystalline flakes; at lower temperatures it takes the consistence of butter, and mixes in all proportions with alcohol and acetic acid. A mixture of 3 parts of castor oil, 3 parts of carbon bisulphide, and 2 parts of sulphuric acid, should not take a brown colour. A castor oil which becomes turbid with petroleum benzene, and gives a clear solution with 5 vols. of alcohol at 90°, may be considered as pure. These characters serve to detect the presence of extraneous fatty oils in castor oil, but not that of resin oil. The latter has a specific gravity of 0.96–0.99, and is soluble in alcohol and acetic acid. On saponifying the oil with soda-lye, shaking the aqueous solution with ether, and expelling the latter by distillation, there remains, if resin oil be present, a residue having all the properties of resin oil. Pure castor oil, if

shaken up with an equal weight of nitric acid at 1.31, turned slightly brown, whilst the acid remained colourless. Resin oil, if treated in the same manner, becomes almost black, whilst the acid turns of a brownish yellow.

Cotton-Seed Oil. G. Papasogli. (*L'Orosi*, xiv. 217-229; *Journ. Chem. Soc.*, May, 1892.) Crude cotton-seed oil contains 65.2 per cent. of solid and 34.8 per cent. of liquid fats; the former consisting mainly of tripalmitin, which, after repeated crystallisation from absolute alcohol, melts at 46° and solidifies at 45° . On saponifying the oil and decomposing the soap thus formed by means of a mineral acid, the product contains 60.24 per cent. of solid fatty acids, 30.36 per cent. of liquid fatty acids, and 9.4 per cent. of glycerol.

The solid portion consists almost entirely of palmitic acid, but on recrystallising it from benzene, a small quantity of a white fat of waxy appearance is left undissolved. The liquid portion, after separation of the small quantity of palmitic acid in solution, is converted into a barium salt, and this, on decomposing with an aqueous solution of tartaric acid, leaves a straw-yellow acid oil, soluble in alcohol, benzene, and ether. This has the composition $C_{20}H_{38}O_3$, and is termed by the author *cotonoleic acid*. It has an acid reaction, and becomes very thick at -17° , but without solidifying. It deepens in colour on exposure to the air, acquiring a reddish tint, and gradually thickening; when exposed to an atmosphere of oxygen, the latter is rapidly absorbed.

Besides the combinations of glycerol with palmitic and cotonoleic acids, there exists in cotton-seed oil a compound isomeric with paraldehyde, $(C_2H_4O)_3$. This is best isolated by saponifying the oil with baryta water, separating the insoluble barium soaps, precipitating the barium in solution by sulphuric acid, extracting the clear liquid with ether, and evaporating the extract. The residue is of a syrupy consistency, and of the same colour as the oil; it dissolves readily in alcohol and water, the aqueous solution having an acid reaction, and reducing Fehling's solution; it readily combines with alkalis, forming compounds which have a resinous appearance when dry.

The author has found that the alcohol employed in Bechi's method for the detection of cotton-seed oil in olive oil is occasionally able to reduce silver nitrate on warming, especially if pure colza oil is added to it; such alcohol may be purified by distilling over potash or lime, and rejecting the first portions of the distillate, but a blank experiment is always necessary as a check.

Cotton-Seed Oil in Olive Oil. D. Vitali. (*L'Orosi*, xiii. 361. From *Pharm. Journ.*) On mixing pure olive oil with twice its volume of ether, a yellowish solution is obtained. If now a few drops of a mixture of equal parts of concentrated sulphuric and nitric acid be added, a brisk reaction is started, after the termination of which the liquid becomes almost colourless.

Cotton-seed oil, under the same circumstances, becomes distinctly yellow, and this colour also appears in a mixture of both oils, so that a quantity of 10 to 15 per cent. of cotton-seed oil may still be recognised in a mixture.

About 5 c.c. of the suspected oil is put into a test-tube, mixed with 10 c.c. of ether, and to this there is added about 5 drops of the acid mixture. When the reaction ceases, the mixture will be colourless if the oil was pure olive oil. But if from 10 to 15 per cent. of cotton-seed oil be present, the mixture is also at first nearly colourless, but on addition of 15 drops more of the acid it will assume a permanent yellow tint. This tint is due to the oxidation of a constituent of the cotton-seed oil, probably its colouring matter, for still better results are obtained by treating the ethereal solution of the oil with chlorinated soda and diluted hydrochloric acid. The same test will detect oil of sesame, which behaves in the same manner.

But cotton-seed and sesame oil differ in this, that the latter becomes colourless, and remains so, when treated with chlorinated soda and hydrochloric acid. Peanut oil, on the other hand, behaves towards chlorinated soda like olive oil. These two oils, however, can be distinguished by the following behaviour: on dissolving olive oil in ether, and carefully treating this with potassium chlorate and sulphuric acid, there results a colourless ethereal layer, and below it an aqueous, somewhat turbid and whitish layer. In the case of peanut oil the ethereal layer is yellowish white, while the aqueous one is turbid and reddish brown. Cotton-seed oil yields a yellow ethereal layer, and a colourless aqueous one. In the case of oil of sesame the latter is green. Sweet oil of almonds behaves like olive oil, but differs from the latter by becoming coloured when treated with the acid mixture, and becoming yellow with chlorinated soda and hydrochloric acid.

Note on "Granilla," an Inferior Cochineal. G. A. Shaw. (*Pharm. Journ.*, 3rd series, xxii. 1055.) The author's observations show that granilla consists of the siftings of the cochineal insects, and contains such matters as might readily contaminate the

cochineals during collection, and that it is not, as stated by some writers, a wild species of *Coccus*.

Inferior Castoreum. W. Fossek (*Pharm. Post.*); L. Reuter (*Schwz. Wochenschr. für Chem. und Pharm.*, 1892, 145; *Amer. Journ. Pharm.*, May, 1892). Fossek describes some castoreum entering commerce from Russia, which, by its appearance and putrid odour, excites attention; it does not appear to be an artificial product, but represents an abnormal, physiological, natural product. An examination revealed 21 per cent. of ash against 2 per cent. from good castoreum. This high percentage of ash is due to the presence of numerous globular concretions having a radiating structure, and which are probably an organic calcium combination. The alcoholic extract amounted to only one-half of the proportion obtained from normal castoreum.

Reuter calls attention to the fact that commercial castoreum may give an aqueous extract having either an alkaline, or a neutral, or slightly acid reaction; the alkaline extracts were never found to give indications of alkaloids, while the neutral or acid extracts very frequently gave precipitates with iodine solution and platinic chloride. He believes that the alkaline reaction is due to some decomposition, and recommends that such castoreum be excluded from use in medicine.

The Active Principle of Male Fern. E. Poulsson. (*Archiv für exp. Path. und Pharmakol.*, xxix. 1-24.) The author arrives at the conclusion that the toxic and anthelmintic properties of the rhizome of *Aspidium filix mas* are due to an amorphous constituent which is the true *filicic acid*. The comparative inertness of the so-called pure crystalline filicic acid is accounted for by showing that the latter is a different body, and is probably an anhydride or lactone of the amorphous acid. For this crystalline body the author proposes the name *filicin*. By dissolving this inactive substance in alkalis and reprecipitating with dilute hydrochloric acid, the resulting amorphous precipitate of real filicic acid possesses all the toxic properties of the extract of male fern. This white precipitate is dried over sulphuric acid. It is readily changed into its lactone, *filicin*, by simply boiling its ethereal solution. Filicic acid melts at 184.5°C ., *filicin* at 125°C . The former corresponds to the formula $\text{C}_{35}\text{H}_{42}\text{O}_{13}$, the latter to $\text{C}_{35}\text{H}_{40}\text{O}_{12}$.

The author considers filicic acid to be well adapted for therapeutical purposes; it is readily soluble in the alimentary canal, but difficultly reduced, and either kills parasitic organisms or

expels them without damaging the canal. It appears to be more readily absorbed if taken with oil than if taken alone.

The Active Principle of *Gymnema Silvestris*. A. Quirini. (*Pharm. Zeitung*, 1891, 401.) In doses of 0.3 to 0.4 gram, *gymnemic acid* acts as an emetic. In much smaller doses it is stated to be very effective for disguising the taste of bitter drugs. For this purpose a $\frac{1}{2}$ per cent. aqueous solution containing a small addition of alcohol is used for rinsing the mouth immediately before taking the medicine.

The acid is obtained by moistening the powdered plant with a solution of caustic soda, allowing the moist mass to stand in a percolator for two days, and then extracting with benzin. After removing the benzin from the percolate by distillation, the residue thus left is repeatedly washed with ether and dried. The product forms a brownish, crystalline powder which is soluble in 100 parts of water, freely soluble in alcohol, and insoluble in ether and chloroform. It is decomposed by acids.

Physiological Action of the Saponins. R. Kobert. (*Chem. Centr.*, 1891, ii. 176.) The author considers that there are a series of saponins of the general formula $C_n H_{2n-3} O_{10}$, several of which are known. Saponins of the same formula and of the same chemical properties appear to have different physiological characteristics, and show great differences in their poisonous action. The sapotoxin of *Agrostemma githago* (corn cockle), one of these substances, is absorbed both by the subcutaneous tissues and by the intestinal canal, and thus acts as a dangerous poison. It is recommended that, before using this seed as a food, the shell and embryo should be separated.

The Anæsthetic Properties of Cocaine. A. Bignon. (*Bull. gén. Thérap.*, 1892, 170.) The author draws attention to a few peculiarities of cocaine. In slightly acid solutions the anæsthetic property of cocaine is rendered latent, but can easily be brought to its full force by neutralizing the acid with a base. He states that the maximum intensity as an anæsthetic is shown when "all the acid is neutralized, the alkaloid cocaine being suspended in a slightly alkaline liquid." A liquid of this kind is prepared by neutralizing the acid with carbonate, not bicarbonate of sodium. 0.05 gram of one of the salts treated as above has the same anæsthetic power as 10 centigrams of the pure crystalline hydrochlorate of cocaine in solution. This alkaline suspension should be prepared at the time when the cocaine is to be used; it will not keep,

as the alkaloid soon collects at the bottom of the vial and cannot easily be again suspended.

Phenol-Cocaine. (*Pharm. Journ.*, from *Formulaire des Médicaments Nouveaux*.) Carbolate of cocaine, which was originally introduced as a local anæsthetic in dentistry, appears to be gaining favour as a remedy for internal administration. The salt is formed by adding an alcoholic solution of phenol to a similar solution of pure cocaine until saturated. On evaporation, a mass of the consistence of honey is left. A commercial specimen of the substance had a semi-crystalline appearance, and had probably been prepared by rubbing together the requisite proportions of phenol and cocaine without the aid of any medium. It is freely soluble in alcohol, which is indicated as the most suitable medium to employ in preparing hypodermic injections. Wool fat is recommended as the best ointment basis when the phenate is to be applied to the skin. Internally it may be given in pills or capsules, and is sometimes used in combination with antifebrin. It may be dispensed with the latter in the form of snuff for nasal catarrh. The dose of phenol-cocaine is from one-fourth of a grain to two grains.

Physiological Action of Caffeine and Allied Compounds. D. Baldi. (*Revue internat.*, February, 1892; *Amer. Journ. Pharm.*, May, 1892.) The author's results are summarized as follows:—

1. *Caffeine* in small doses increases muscular excitability in dogs and frogs.

2. *Xanthine* has no action in this direction, but determines in the muscles the cadaveric rigidity almost to the same degree as caffeine.

3. *Allantoine* does not increase spinal excitability; but elevates muscular excitability in the frog, and determines cadaveric rigidity nearly the same as xanthine.

4. *Alloxanthine* does not increase either spinal or muscular excitability, and in the frog does not determine rigidity.

5. The spinal and muscular hyperexcitability, produced by caffeine, is due to the methyl groups attached to the xanthine nucleus, but the cadaveric rigidity is due to the xanthine liberated in the organism.

Therapeutic Action of Ouabain. J. Sailer. (*Therapeutic Gazette; Chemist and Druggist*, April 9th, 1892.) The author's experiments show that the first effect of ouabain consists in a diminution of the rate of pulsation, due to a stimulating influence upon the cardio-inhibitory function, and perhaps partly to a direct

action upon the heart-muscle. At the same time there is a primary vaso-motor spasm, due to an action either upon the vaso-constrictor fibres or the muscular coats of the vessels. The slower beating of the heart may be so marked, in exceptional instances, as to overcome the vaso-motor spasm and cause a fall of pressure. Then there is a sudden and great increase in pulse-rate, caused by depression and final paralysis of the vagi, and, at the same time, increase in pressure, due partly to increased heart-action and partly to continued stimulation of the vaso-motor system. At last the heart-muscle is paralysed, and in a few seconds the pressure also falls to zero. Therapeutically it may be regarded as a powerful emetic, and it acts as such when injected subcutaneously. It promotes defecation, and increases the flow of urine. It does not appear to affect the temperature of the body. The author thinks that in very small doses it may in many cases prove a useful substitute for digitalis, but that its greatest value will be found to consist in its power as a local anæsthetic, which is decidedly superior to that of cocaine. For whatever purpose this drug may be tried, it should never be forgotten that it is an extremely powerful poison.

Therapeutic Action of Orexin. J. Gordon. (*Lancet*, and *Chemist and Druggist*.) The author reports favourably on the use of hydrochlorate of orexin as an appetiser. He finds that in the loss of appetite, concurrent with tubercular disease, it is a valuable stimulant. The tongue rapidly becomes less furred, and constipation is relieved.

Therapeutic Properties of Anemonine. M. Dupuy. (*Chemist and Druggist*, December 19th, 1891.) The author reports that anemonine, the active principle of wood anemone, is a medicine of great value in the treatment of chronic bronchitis and coughs. There are also indications that it is of benefit as an emmenagogue. Anemonine occurs in fine needle-shaped crystals, and is poisonous in large doses.

Physiological Action of Gallic and Tannic Acids. C. T. Mörner. (*Zeitschr. für physiol. Chem.*, xvi. 255-267.) Baumann and Wolkow have shown that homogentisic acid, which occurs in the urine in cases of alcaptonuria, reduces an ammoniacal solution of silver nitrate, and this reaction serves for the estimation of the acid. The present investigation shows that it may also be applied to the estimation of gallic acid in the urine. By its means, a percentage of 0.001 of gallic acid, artificially mixed with the urine, can be recognised. The amount of ammonia used was 1 c.c. of

the concentrated solution (or 3 c.c. of the 10 per cent. solution) to 10 c.c. of urine. The end reaction was ascertained by testing with hydrochloric acid the liquid filtered off from the reduced silver. From comparative experiments with normal urine, it is found necessary to deduct 1·3 c.c. of the silver solution used for 50 c.c. of urine.

When gallic acid is given by the mouth (to human beings and dogs) in small quantities, none appears in the urine; but given in larger quantities, a certain amount passes as such into that secretion; thus, when 6, 4, 2, and 1 gram respectively are administered, 30, 20, 5, and 2 per cent. respectively appear in the urine. When tannin is given, none reappears as such in the urine; it seems to be entirely destroyed in the body; when large doses are given, however, a small quantity of gallic acid is found in the urine; when 8 to 10 grams are administered, only 1 per cent. is found as gallic acid in the urine.

Pyrogallie acid is not detected in the urine.

Therapeutic Properties of Hydrastinine. P. Strassmann. (*American Druggist*, January 15th, 1892, from *Pharm. Zeit.*) The author publishes the results of a study of the therapeutic properties of hydrastinine, and confirms the statement of Falk and others that it promptly checks uterine hæmorrhages. He states that its proper dose per day should not exceed 0·15 gram (about $2\frac{1}{2}$ grains), and that it is best administered in single doses of about 0·025 gram ($\frac{1}{3}$ of a grain), either hypodermically or by the mouth.

Anthelmintic Properties of Santoninoxime. F. Coppola. (*Union méd.*) This body, the composition of which corresponds to the formula $C_{15}H_{19}NO_3$, was first prepared by P. Guici a few years ago, and is obtained in the form of white needles by digesting santonin with hydroxylamine hydrochloride, precipitated calcium carbonate, and alcohol at a temperature of $80^{\circ}C$. for several days. The author confirms its value as an anthelmintic, and regards it as a safe and reliable substitute for santonin, over which it has the advantage that its administration is not followed by any unpleasant effects. The dose is from 3 to 15 grains.

Hæmostatic Effects of Atropine. M. Dimitrieff. (*Bull. gén. Thérap.*, 1892, 236.) The author has used atropine hypodermically with beneficial results in two cases of hæmorrhage, which would not yield to the usual remedies. One of the cases reported was one of uterine hæmorrhage. The dose of atropine used was 0·3 milligram for each injection.

Physiological Action of Camphors, and of their Compounds with Chloral. C. Schmitt. (*Comptes rend. Soc. Biol.*, 1890, 678-683; *Journ. Chem. Soc.*, May, 1892.) In experiments on rabbits, it was found that by giving borneol after chloral hydrate, the depressing action of the chloral was augmented by that of the borneol, whereas menthol in part counteracted this depression. Starting from this, the physiological action of compounds of chloral with the camphors was investigated.

Camphor dissolves in anhydrous chloral, but does not form definite compounds with it, whereas borneol and menthol do. The mixture of camphor and chloral produces the same effects as if the drugs were given successively, the convulsive effects of the camphor being masked by the sedative action of the chloral.

Chloral bornylate, $\text{C Cl}_3 \cdot \text{C H (O H) } \cdot \text{O C}_{10} \text{H}_{17}$, forms white crystals insoluble in water, and melts at 45-55°. It is very toxic, producing a lowering of blood pressure and temperature to a greater extent than can be accounted for by the amount of chloral it contains.

Chloral menthylate, $\text{C Cl}_3 \cdot \text{C H (O H) } \cdot \text{O C}_{10} \text{H}_{19}$, is a transparent, yellowish liquid, of the consistence of glycerol, insoluble in water, soluble in alcohol of 90°, and in oil. When distilled with water, it dissociates into menthol and chloral hydrate; an analogous dissociation in the body probably accounts for its physiological action. It irritates the mucous membranes when applied locally. Given subcutaneously or by the mouth, it leads to paralysis of the posterior limbs, and then to sleep; the soporific action is the same in its strength and duration as that produced by a corresponding dose of chloral hydrate, although its onset is somewhat delayed. The paralytic effects and lessening of reflex action are due to the menthol. The movements of respiration and of the heart are affected in the same way as with chloral; the depression of temperature is, however, not so marked. Blood pressure is first lowered, then rises, remaining stationary at a lower level than the original. Thus, to some extent, the menthol corrects the depression due to the chloral.

Value of Sulphonal for the Relief of Night Sweats. M. Erede. (*Amer. Journ. Pharm.*, November, 1891.) The author arrives at the conclusion, based on a large number of observations, that medium doses ($\frac{1}{2}$ to 1 gram) of sulphonal suppress the phthisical night sweats with certainty, the effect continuing for some days after the cessation of the medicine.

Hypnotics and Digestion. J. Gordon. (*Brit. Med. Journ.*, July 18th, 1891, 115; *Pharm. Journ.*, 3rd series, xxii. 83.) Observation of gastric disturbances that occasionally follow the administration of chloralamide, paraldehyde, urethane, and sulphonal has led the author to test the influence these compounds may exercise upon digestion. The method adopted was to submit fibrin stained with carmine to the action of pepsin in the presence of the hypnotic, the progress of the digestion being indicated by the liberation of colour from the fibrin. For this purpose half a gram of stained fibrin was placed in a test-tube, together with 2 decigrams of pepsina porci, 2 c.c. of 2 per cent. hydrochloric acid, and 15 c.c. of water, and the hypnotic added. The results of the experiments showed that when more of chloralamide than 0.2 gram was added, it retarded the digestion of fibrin in the ratio of the quantity employed, but that less than 0.2 gram exercised no perceptible influence. Similar results were obtained with urethane and sulphonal, and none of the three retarded decomposition. On the other hand, paraldehyde added in large quantities considerably accelerated the digestion of fibrin, and generally the rate of acceleration was in ratio with the quantity used. Putrefaction also was prevented by large proportions of paraldehyde and delayed by smaller proportions. So far, therefore, as inferences can be drawn from results obtained outside the organism, the diarrhoea that sometimes follows the exhibition of paraldehyde is not referable to direct interference with digestion.

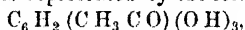
A new Vegetable Digestant. T. Peckolt. (*American Druggist*, April 15th, 1892.) A digestive ferment has been isolated from the milk juice of the Brazilian white fig-tree (*Urostigma Dolarium*) by the author. The milk juice of this tree is of a creamy consistence, has an almond-like flavour, and readily dissolves fibrin and coagulated egg albumen. In addition to this ferment the juice contains caoutchouc and a principle named dolarin, which, it is claimed, has tannic acid properties.

Thilanin. (*Pharm. Centralkalle*, 1891, 678.) Thilanin is the name given to a preparation intended to replace thiol and ichthyol in dermal practice. It is a brownish-yellow, unctuous substance containing 3 per cent. of sulphur, and is obtained by the action of sulphur upon lanolin. It is claimed to be specially valuable as an application in skin diseases on account of its freedom from irritating properties.

Gallacetophenone as a Remedy in Skin Diseases. Dr. Pekowski. (*Pharm. Zeitung*, October 7th, 1891.) Gallacetophenone has

recently been introduced into therapeutics as a valuable remedy for the treatment of psoriasis and parasitic skin diseases. It is stated to be quite as active as pyrogallol, and to be free from the disadvantage of staining. It is a yellow powder soluble in hot water, alcohol, ether, and glycerine. It is also readily soluble in a cold aqueous solution of sodium acetate. From a solution in hot water it crystallizes on cooling in yellow needles melting at 70°C . It is comparatively non-poisonous. It may be employed in the form of an ointment containing 10 per cent. of gallacetophenone, or in the form of a solution of one drachm of this remedy and one ounce of sodium acetate in $3\frac{1}{2}$ ounces of water.

Gallacetophenone is represented by the formula



and may be regarded as pyrogallol, or trihydroxybenzene, $\text{C}_6\text{H}_3(\text{OH})_3$, with a further atom of hydrogen of the benzene nucleus replaced by an acetyl group.

The Therapeutic Properties of Salicylamide. W. R. Nesbitt. (*Therapeutic Gazette*, October 15th, 1891, 686. From *Pharm. Journ.*)

The author is of opinion that for therapeutic purposes salicylamide presents advantages over salicylic acid and its salts in being free from taste, more soluble than salicylic acid, acting more promptly and in smaller doses, having greater analgesic properties and being pharmacologically safer. Salicylamide, $\text{C}_6\text{H}_4\begin{smallmatrix} \text{OH} \\ \diagup \\ \text{C} \end{smallmatrix} \text{O} \cdot \text{NH}_2$

was first prepared by Linpricht, by treating gaultheria oil with concentrated solution of ammonia, a method preferred by the author as avoiding the possibility of introducing foreign toxic compounds, as might be the case when an artificially produced methyl salicylate is used. When ammonia and gaultheria oil have stood together in the cold for some days, the liquid assumes a deep reddish-brown colour, and separation takes place in brown crystals that can be easily purified by recrystallization. From a saturated solution rapidly cooled it separates in an acicular form, otherwise it occurs in thin long plates or bunches of plates. By treatment with charcoal the author found it easy to obtain perfectly colourless, thin transparent plates, melting at 142°C ., soluble in alcohol, ether, chloroform, and about 250 parts of water.

Salicylamide is quite tasteless, but produces a gritty sensation between the teeth. It is excreted in the urine partly unaltered, but chiefly as salicyluric acid. It possesses decided germicidal properties, and it was found that both diastatic and peptic changes are retarded by it, but not to the same extent as by salicylic acid.

Salicin in Influenza. E. B. Turner. (*Lancet*, July 18th, 1891, 121.) The author reports that he has been very successful in the treatment of influenza with twenty-grain doses of salicin. The first dose should be given on the first appearance of the symptoms, and should be repeated every hour at first, and subsequently at longer intervals. He found that, under this treatment, the temperature was generally reduced to the normal condition in the course of about six hours, and convalescence established as a rule in about twenty-four hours. In about two hundred cases thus treated, no complication, such as bronchitis or pneumonia, occurred.

Paracresotic Acid as an Antipyretic. (*Bull. Therap.*, cxxii. 85. From *Pharm. Journ.*) Egasse draws attention to the advantages of this substance as an antipyretic, and suggests that the use of a mixture of the three isomeric forms of the acid may have been the reason of its not being adopted in general practice. The observations of Demme have shown that of the three isomers paracresotic acid is the most effectual and the most inoffensive. Metacresotic acid is less active, and orthocresotic acid possesses decidedly toxic properties, causing paralysis of the cardiac muscle. It is probably to the presence of this body in the cresotic acid hitherto employed that the observed prejudicial effects are to be attributed. According to Demme the sodium salt of paracresotic acid may be taken to the extent of 3 or 4 grams without producing any ill effect. He did not find it influence the temperature, and he did not experience any gastric disturbance. Loesch states that the acid is eliminated, partly in the pure state and partly in association with glycosuric acid. Its presence in the urine may be recognised by perichloride, which gives a violet coloration. Demme has used it for children in the Jenner Hospital, at Berne. As an antipyretic it is inferior to salicylic acid, but, on the other hand, it is free from some of its disadvantages, being better tolerated by the digestive organs, and not producing the congestion which salicylate sometimes causes.

The Pharmacology of Oxalic Acid. R. Kobert and P. Krohl. (*Pharm. Centralhalle*, 1891, 569.) The authors confirm the observation previously made by Kobert and Küssner, that the administration of oxalic acid produces glycosuria. They also show that neutral oxalates, as well as oxaluric acid and its salts, have the same action. Oxamide, though less active on account of its insolubility, is also found to produce glycosuria.

Glycosuria, brought about by the administration of oxaluric

acid, can be promptly removed by treatment with extract of *Syzygium jambolanum*.

Creasote in Tuberculosis. J. Sommerbrodt. (*Berl. klin. Wochenschr.*, October 19th, 1891.) As the result of trials extending over nine years, the author feels justified in giving a most favourable account of the action of creasote in tuberculosis. For a patient above 10 years of age, the smallest dose is 1 grain daily, while his maximum dose is 4 grains per day. In no case has he met with any unpleasant effects. He prefers to administer it with cod-liver oil in capsules containing 1 grain of creasote in each. He considers this remedy as unsurpassed as a curative agent in pulmonary tuberculosis. It is well borne by the stomach, and does not impair but rather increases the appetite.

Chloride of Zinc in Tuberculosis. Prof. Lannelongue. (*Lancet*, July 11th, 1891, 94; *Pharm. Journ.*, 3rd series, xxii. 82.) The treatment recommended by the author is based upon the property possessed by chloride of zinc, when injected in sufficiently small quantity to avoid its escharotic action, to set up a process of induration in healthy tissue. Advantage is taken of this to attempt to invest the tuberculous formation with a sheath of sclerotic tissue, and thus to limit, if not destroy, the activity of the bacilli by a kind of encapsulation.

Strontium Lactate as a Remedy for Tape-Worm. J. V. Laborde. (*Répertoire de Pharm.*, 1892, 85.) The author finds a solution of 20 grams of strontium lactate, and 30 grams of glycerine in 120 grams of distilled water, given in doses of two tablespoonfuls daily for five days, to be an excellent tannicide.

Therapeutic Effects of Strontium Lactate. C. Paul. (*Revue Thérap.*, November 15th, 1891.) Attention is called by the author to the power of strontium lactate to cause the rapid and complete disappearance of albumen from urine. It is administered in doses of a teaspoonful of a solution of one part of the lactate in five parts of water, night and morning. His results are confirmed by Dujardin-Beaumetz.

Solution of Strontium Lactate for Therapeutic Purposes. A. Thumann. (*Journ. der Pharm., Els.-Lothr.*, 1892, 84.) See also the two preceding abstracts. 44.84 grams of strontium nitrate, previously freed from any calcium nitrate by repeated washing with alcohol of 96 per cent., are dissolved in a litre of distilled water, and then freed from any barium that may be present by precipitation with a small quantity of dilute sulphuric acid. The filtrate is mixed with a solution of 60 grams of sodium carbonate

in a litre of water, the precipitated strontium carbonate collected on the filter, well washed, and dissolved at a gentle heat in a solution of 36 grams of pure lactic acid in 200 c.c. of water. Finally the resulting solution is diluted with water to 550 grams. The product contains about 10 per cent. of anhydrous strontium lactate.

Physiological Action of Strontium Salts. J. V. Laborde. (*Comptes rendus Soc. Biol.*, 1891, 562-566.) The authors previously reported that while the salts of barium are highly toxic, those of strontium are perfectly harmless. This observation is confirmed in the present paper, in which it is also shown that the lactate, tartrate, and bromide have a slight diuretic action. Strontium salts are partly eliminated in the urine, but mostly through the faeces. Some assimilation seems to take place, as the liver and bones have been found to contain strontium after its administration.

Anthelmintic Properties of Naphthalin. Dr. Mirovich. (From the *Lancet*.) The author confirms the value of naphthalin as a remedy for ascarides and tape-worm. He also finds it much less hurtful than most of the other vermifuges. For adults he prescribes a dose of 15 grains to be taken first thing in the morning, and to be immediately followed by a large dose of castor oil. The usual preparatory diet is to be observed for two days previous to the administration of the medicine. In all the cases of tape-worm in which he tried this remedy, the worm was expelled with its head after the administration of the above dose.

Thiophene Derivatives as Therapeutic Agents. E. Spiegler. (*Répertoire de Pharm.*, 1892, 157.) Thiophene-sulphonic acid and thiophene biniodide have recently been introduced into therapeutics. The former is a white crystalline powder containing 33 per cent. of sulphur, and is proposed for use in prurigo, in the form of a 10-20 per cent. ointment, with equal parts of vaselin and lanolin as a base. The sodium salt of this acid is preferred to beta-naphthol in cases of prurigo complicated by eczema. Thiophene biniodide is analogous to iodol, and forms a crystalline powder, of peculiar aromatic and not disagreeable odour. It contains 75 per cent. of iodine, and 9 per cent. of sulphur. It is insoluble in water, soluble in hot alcohol, ether, and chloroform. It is recommended as a substitute for iodoform in the form of powder or gauze.

Thiophene Preparations. (*American Druggist*, April 15th, 1892, from *Therap. Monatshefte*.) Therapeutically, two derivatives of thiophene have been so far used, viz., sodium thiophenesulphonate and thiophene diiodide.

Sodium thiophenesulphonate ($C_4H_4S-NaSO_3$) appears in the form of a white powder, contains over 30 per cent. of sulphur, half of it combined directly with carbon, and is neither an irritant nor toxic, in which latter respect it has an advantage over beta-naphthol.

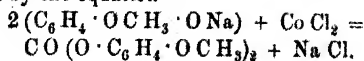
The salt has been used with good results in prurigo, in the form of a 10 per cent. ointment made with lanolin or vaselin. It is also applicable in complicated eczema, and, in the case of children, where naphthol cannot be used.

Thiophene diiodide ($C_4H_2I_2S$) appears in white crystals, melting at $40.5^\circ C.$, and being insoluble in water, but easily soluble in ether, chloroform, and warm alcohol. It contains 75.5 per cent. of iodine, and 9.5 per cent. of sulphur. In its pure state it has a strong, characteristic odour. A 10 per cent. gauze prepared with it has a faintly aromatic agreeable odour. It should not be applied to the surface of the skin or wounds in greater strength than a 10 per cent. gauze, or corresponding dilution, since it is apt to cause a burning sensation. It is a powerful deodorizer of fetid exudations, far superior in this respect to iodoform. All trials made with it in surgical practice have given very satisfactory results.

Eczema, such as occasionally appears under iodoform treatment, was never observed. On the other hand, when eczema was caused by iodoform, treatment with thiophene diiodide caused it to disappear.

The thiophene-diiodide gauze is prepared by dissolving the iodide in equal parts of alcohol and ether, with addition of glycerine (10 parts in 1,000). The amount of iodide to be used depends upon the strength of the gauze to be produced. As the substance is colourless, it is considered advisable to tint the solution with a little eosine, which also enables the eye to see whether the solution has been equally distributed through the fabric. The prepared gauze must be preserved in well-closed vessels.

Therapeutic Application of Guaiacol Carbonate. (*Pharm. Journ., from Berlin. klin. Wochenschr.*) The irritation produced by guaiacol, as well as by creasote, is in some instances sufficient to prevent their use, and it is proposed to overcome this difficulty by the substitution of the guaiacol carbonate, obtained by Seifert and Holscher. It is prepared by passing chlorocarbonic gas into a mixture of guaiacol and caustic soda. The reaction taking place is represented by the equation—



The product has the form of a crystalline powder, free from taste or smell, melting at 86° – 90° , insoluble in water, sparingly soluble in cold alcohol, freely soluble in hot alcohol, ether, chloroform, or benzine. It has no irritating action upon the mucous membrane, and does not disturb the digestive organs. In the healthy stomach it is unaltered, but is split up in the intestine by hydrolysis. In the stomach of persons suffering from phthisis a considerable decomposition is caused by the bacteria present, and thus their development is prevented. The small proportion of carbonic anhydride liberated is of little account, and the guaiacol liberated is at once absorbed, so that there is no accumulation of it in the intestine. Within an hour of administration the presence of guaiacol in the urine can be detected.

Therapeutic Application of Piperazine. M. Finzelberg. (*Pharm. Centralhalle*, xxxiii. 145.) Attention has recently been directed to the great solvent action of piperazine on uric acid (see *Year-Book of Pharmacy*, 1891, 72). On account of this property, it has been introduced into therapeutics for the treatment of calculus, gout, etc. The author states that it should not be administered in the form of pills or powders, but always in solution. For the purpose of dissolving or breaking up calculi in the bladder, the local application of a 3 to 5 per cent. solution is suggested, and is stated to produce no irritation of the mucous membrane. Piperazine has also been locally applied with success to open gouty sores.

Therapeutic Application of Piperazine. Dr. Henbach. (*Centralb. für Physiol.*, December, 1891; *Amer. Journ. Pharm.*, February, 1892.) Piperazine has lately come into use in the treatment of gout, gravel, and urinary calculus, due to uric acid concretions (preceding abstract). The author has given it subcutaneously in doses of 0.5 gram four times daily, the injections being painful, but without causing abscesses or unpleasant after-effects. Taken internally in doses of 2.5 grams, it caused severe headache on the following morning, and in one case vomiting. Doses of 1 gram were taken regularly for several days without causing any derangement. The quantity of urine is not increased; it remains acid, and shows no increase of urea or phosphates. But passed from the fourth to the tenth hour after taking the remedy it becomes dark coloured on the addition of hydrochloric acid, the colouring matter being separable by means of amylic alcohol.

The Action of Antifebrin and Phenacetin Derivatives. H. Aronsen. (*Med. Chronicle*, January, 1892.) It has been shown

by Ehrlich that certain kinds of colouring materials taken into the body will distinctly colour the brain tissue; but that the introduction into the colouring compounds of a sulpho group prevents this. Thus, for example, *sodium alizarin* colours the brain yellow, whilst the introduction of a sulphonic-acid group into this compound entirely prevents this action.

The author brings forward experiments to show that in like manner the influence which certain antipyretics have in lowering temperature in fever, through their influence on the nervous centres, is entirely stopped if an acid group be introduced into their composition.

Liebreich has shown that *acetyl-amido-salicylic acid*, which contains two antithermic groups, antifebrin and salicylic acid, is not itself an antipyretic, and the ethyl compound of this body is likewise not a temperature reducer. In both these bodies the carboxyl group COOH is associated with the benzol component. But it is possible to introduce this group into the second or amido component. Only one body (*acetanilid-acetic acid*) in which such introduction has occurred has yet been examined, and it has been found by Penzolt not to be useful as an antipyretic.

The author points out that this influence may perhaps be due to the breaking up of the group $\text{C}_6\text{H}_5\text{NHCO}$, to which the compound seems to owe its antipyretic activity, for the introduction of a CH_3 into the amido component has the same effect in depressing the antipyretic influence. He has, therefore, experimented on a substance—*para-ethoxytartranilic acid*—in which the carboxyl group is neither combined with the benzol nor with the amido component. This substance is a white, tasteless powder, not as toxic as phenacetin, though in sufficient doses it causes changes in the blood. Unlike phenacetin, however, it does not depress temperature in fever. *Succinanilic acid*, which is of analogous composition, gave the same result.

These experiments all tend to show that in whatever way the carboxyl group COOH is introduced into an antifebrin or phenacetin molecule, it destroys its antipyretic quality. The author finds, too, indications that the presence of other acid elements, apart from the salt-forming acid group, suffice to prevent the antipyretic activity in the same manner as the carboxyl group does.

Acetylpara-amidoacetophenone has the same composition as phenacetin, except that the group OC_2H_5 is replaced by the acetyl group COCH_3 , but the antipyretic action of phenacetin is quite

wanting in the first-named compound. If it were possible to introduce an acid element into acetanilid or phenacetin, without destroying their antipyretic properties, a soluble antipyretic could be obtained. But the author's observations show that this is impossible, and a soluble antipyretic can only be obtained from acetanilid or phenacetin by putting into these compounds a basic group. Such a substance is *phenocoll*, the antipyretic and anti-rheumatic properties of which have been recently proved by Hertel.

Salipyrine. (*American Druggist*, April 15th, 1892.) Salipyrine is a chemical compound of antipyrine and salicylic acid, 57.7 parts of the former to 42.3 of the latter. It occurs in the form of small colourless crystals, slightly soluble in water but freely so in alcohol, having a mildly astringent, subacid taste. It is supposed to combine therapeutically the properties of its two component parts.

Salophen. F. Goldmann. (*Pharm. Zeitung*, 1891, 773.) Salophen, or acetylparaamidosalol, is a synthetic product, the composition of which is stated to correspond to the formula $C_6H_4(OH)COOC_6H_4NHCOCH_3$. It forms minute laminar, odourless, and tasteless crystals, slightly soluble in boiling water, more freely soluble in warm alcohol, ether, and in alkaline solutions, and fusing at $188^\circ C$. It contains about 51 per cent. of salicylic acid, and is recommended in doses of 4 to 6 grams per day in cases of acute articular rheumatism. Its administration is said to be free from any ill effects.

Therapeutic Application of Calcium Salicylate. S. Torescu. (*Zeitschr. des oester. Apoth. Ver.*, 1891, No. 32.) This salt is used, either alone or in combination with salicylate of bismuth, as a remedy in diarrhœa, particularly of children, and also in gastro-enteritis, in doses of 0.5 to 1.5 grams. It is obtained by precipitation from a slightly alkaline solution of sodium salicylate by means of a solution of calcium acetate.

Analgene. (*Apoth. Zeitung*, 1892, 141.) Analgene, or more exactly, orthoethoxethyl- and monoacetylamido-quinoline, is the result of an endeavour to unite the acetamido and oxyethyl groups with a nucleus also having antipyretic effect, so as to produce a new body of corresponding physiological power. The formula is $C_9H_5(OCH_2CH_3)(NHCOCH_3)N$. The preparation is given in doses of one gram to alleviate rheumatic pain.

Thymacetin, a New Remedy. (*American Druggist*, February 15th, 1892.) This name is given to a derivative of thymol bearing

the same relation to the latter which phenacetin does to phenol. Its chemical composition is represented by the formula $C_{14}H_{21}NO_2$. It is a white, crystalline powder, difficultly soluble in alcohol.

Thymacetin has been found to be a prompt remedy in nervous headache, and is also capable of serving as a hypnotic, though it cannot take the place of morphine. The dose for adults is from 4 to 16 grains. Further reports are promised.

Hæmol and Hæmogallol. R. Kobert. (*Chemist and Druggist*, April 9th, 1892.) Under these names E. Merck has introduced, at the author's suggestion, two new preparations—hæmol being a zinc derivative of the blood-colouring matter, and hæmogallol a pyrogallol derivative of the same. The former is a blackish-brown powder, and the latter reddish-brown. They are used in doses of 2 to 8 grains thrice daily in preference to iron preparations for the treatment of anæmia, and the results obtained appear to be highly satisfactory. The preparations are given in wafers or combined with chocolate.

Antinervin. H. Prüsse. (*Chemist and Druggist*, December 19th, 1891.) Some time ago Ritsert observed that the mixture of acetanilid and salicylic acid, which forms the greater part of the preparation known as "antinervin," is remarkable for the fact that the melting-point of the mixture is much below that of its constituents. The author has recently investigated this matter, and reports as follows:—Acetanilid melts at 114°C ., and salicylic acid at 156°C ., but antinervin melts at about 80°C . The following are the results obtained from the examination of various mixtures, the lower figures denoting when melting began, and the higher when it was complete:—

One equivalent of salicylic acid with

1 equivalent of acetanilid . . .	82°C .— 119°C .
$\frac{1}{2}$ " " " " . . .	93°C .— 141°C .
$\frac{1}{3}$ " " " " . . .	127°C .— 148°C .
$\frac{1}{10}$ " " " " . . .	139°C .— 150°C .
$\frac{1}{100}$ " " " " . . .	144°C .— 154°C .

One equivalent of acetanilid with

1 equivalent of salicylic acid . . .	82°C .— 119°C .
$\frac{1}{2}$ " " " " . . .	76°C .— 86°C .
$\frac{1}{3}$ " " " " . . .	88°C .— 100°C .
$\frac{1}{10}$ " " " " . . .	91°C .— 104°C .
$\frac{1}{100}$ " " " " . . .	107°C .— 111°C .

It is evident from these figures that as small a proportion as $\frac{1}{100}$ th equivalent of either body mixed with the other is capable of

materially altering the melting-point, and, obviously, antinervin is as nearly as possible represented by a mixture of 1 equivalent of acetanilid and half an equivalent of salicylic acid.

Solutol and Solveol, Two New Disinfectants. F. v. Heyden. (*Zeitschr. des öst. Apoth. Vereins*, December 10th, 1891; *American Druggist*, January 15th, 1892.) Under the name of *solutol* the author introduces a soluble form of cresol. The solubility of cresol is brought about by the presence of cresol-sodium. The preparation contains, in 100 c.c., 60.4 grams of cresol, one-fourth of it in a free state and the remainder as cresol-sodium.

Solutol has been found to be a most efficient disinfectant for general domestic or hospital purposes, such as sinks and water-closets, infected clothing, sputa of consumptives, etc., and an excellent preservative of dead bodies.

It is not suitable for medical or surgical disinfection, owing to its strongly alkaline character.

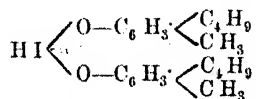
Solveol, on the other hand, is a disinfectant and antiseptic specially designed for surgical purposes. In this the solution of cresol is brought about by the presence of sodium cresotate. The compound is soluble in water to a perfectly clear liquid, which, while much more efficient than carbolic acid, is at the same time much less poisonous.

For medical or surgical purposes the most suitable strength of solution is:—

Solveol	.	.	.	.	.	.	37 c.c.
Water	.	.	.	.	.	to make	2,000 c.c.

For disinfecting the air in sick-rooms, by spraying, 37 c.c. of solveol should be dissolved in 480 c.c. of water.

Europphen. F. Goldmann. (*Pharm. Zeitung; Chemist and Druggist*, July 18th, and September 26th, 1891.) This name is given by F. Bayer & Co., of Elberfeld, to a new antiseptic introduced as a substitute for iodoform, and appears to be an iodide of isobutylcresol, containing one atom of iodine in combination with two molecules of isobutylcresol. Its constitution is represented by the formula



It is stated to be prepared by the action of zinc chloride on a mixture of isobutyl alcohol and orthocresol when heated, and treating the product with an alkaline watery solution of iodine in

potassium iodide, chlorinated lime being added, if necessary, to complete oxidation. The europhen is formed as an amorphous precipitate, and on purification is obtained as an amorphous yellow powder, containing about 28 per cent. of combined iodine. It has a peculiar aromatic odour, resembling saffron. It adheres readily to the skin, and is insoluble in water and glycerine, but dissolves easily in alcohol, ether, chloroform, and collodion. Olive oil dissolves 25 per cent. of its weight of europhen. The author describes the properties of the substance at great length, and states that in bactericidal properties one part of it has been found to be equal to five parts of iodoform.

As regards the therapeutic properties of this substance, F. Bayer & Co. call attention to the advantage it possesses over other iodoform substitutes, and even over iodoform itself, on account of its lightness. It has two-thirds of the specific gravity of soziodol, half that of iodol, and less than a fifth of that of iodoform. Ointments and solutions of europhen must be prepared in the cold, and solutions require filtration, as an insoluble iodine compound tends to form, which sometimes causes them to assume a gelatinous consistency. Dr. Eichhoff has prescribed it with advantage in several venereal and syphilitic cases, obtaining very satisfactory results in both soft and hard chancres, in mucous patches, and in tertiary ulceration, by means of 1 or 2 per cent. of ointment. Hypodermic injections of from one to two grains of europhen dissolved in oil, repeated daily for from twenty-four to forty days, completely cured three cases of secondary syphilis without any other medicament. Attempts to cure gonorrhœa by injections of an emulsion of europhen of the strength of from 1 in 300 to 1 in 75 proved a complete failure, owing to the painful irritation set up. Excellent results were obtained by the application of europhen to simple ulcers, either in the form of powder or in that of ointment; but these proved useless in parasitic eczema, psoriasis, and favus. In general, it was found that europhen acts only when brought in contact with secreting surfaces, whereby it is decomposed and iodine liberated. When it is applied to dry surfaces it appears to be inert, except, indeed, that if in an ointment of greater strength than 2 per cent., it acts as an irritant and sets up eczema. The bacteriological experiments with europhen, which have been made by Dr. W. Siebel, of Elberfeld, and reported recently to the *Therapeutische Monatshefte*, have been also very satisfactory, and show that it is possessed of bactericidal power at least equal to iodoform.

Tumenol, a New Remedy in Skin Diseases. Prof. Neisser. (*Deutsch. Med. Wochenschr.*, November 5th, 1891, 1238. From *Pharm. Journ.*) According to Spiegel, all mineral oils contain a class of unsaturated hydrocarbons, capable of reacting towards sulphuric acid and of being converted by it into still less saturated derivatives. These hydrocarbons are said to constitute the mother substance of tumenol. For the preparation of the tumenol compounds the mineral oil is first treated for the separation of phenols and acids with soda lye, and afterwards for the removal of bases and pyrrol-like bodies with 70 per cent. sulphuric acid. Upon treating the purified oil with concentrated sulphuric acid, the unsaturated hydrocarbons undergo sulphonation, with evolution of sulphur dioxide, and a dark-coloured acid syrup is formed, from which can be separated, by washing with water and solution of sodium chloride, a mixture of sulphon and sulphonic acid. This is treated with soda lye, to convert the sulphonic acid into a salt, and then shaken with ether, which takes up the sulphone and leaves the sodium salt in the aqueous liquid. The "tumenol-sulphone," after purification, is described as being a dark-yellow, thick liquid, readily soluble in ether, ligroin, and benzol. Although it is insoluble in water, it is taken up by an aqueous solution of tumenol-sulphonic acid, to which it imparts a strongly bitter and aromatic taste. Upon analysis, tumenol-sulphone gave figures approximating to the formula $(C_{41}H_{67}O)_2S O_2$. Tumenol-sulphonic acid is obtainable as a dark powder, having a peculiar faintly bitter taste. It is easily soluble in water, and the solution can be evaporated to the consistence of an extract without separation taking place; it is, however, precipitated from solution by acids or salts. In a faintly acid solution of gelatin it forms an elastic caoutchouc-like precipitate, that can be drawn out into threads. The alkali salts of tumenol-sulphonic acid are easily soluble in water, from which they can be salted out like soaps. The salts of the alkaline earths and heavy metals are insoluble in water, with the exception of those of antimony and mercury. The acid converts corrosive sublimate into calomel upon boiling; it also reduces ferric chloride to a ferrous salt, and permanganate to a lower oxide of manganese, and upon boiling with an acidulated solution of bichromate is converted into an insoluble oxidation product. The figures obtained in an analysis of the calcium salt corresponded to the formula $(C_{41}H_{51}O_{21}S O_3)_2 Ca$. "Commercial tumenol" contains both the sulphone, which, from its consistence, is designated "tumenol oil," and the sulphonic acid,

which has been called "tumenol powder." As, however, the acid in the powder form is relatively costly, it is used also in a viscous condition. The author states that he has experimented with two forms of tincture, one containing about 10 per cent. of tumenol, the mother substance, dissolved in a mixture of equal parts of ether, rectified spirit, and water, and another in which glycerine was substituted for the water. The former, when painted on a surface, dries readily and completely, but the latter forms a somewhat fatty, smeary coating, which holds a dusting powder well. Of the purified sulphonic acid, aqueous solutions were used. The tumenol is said to make up very well with zinc-gelatine, and all three preparations were used in the form of ointment, pastes made with zinc-oxide and starch, and soap plasters; but for the ointments and pastes the commercial tumenol, or the tumenol oil (sulphone), was found most suitable. The author considers the tumenol compounds to differ entirely from ichthyol, since they depend for their therapeutic action rather upon their powerful reducing properties than upon the combined sulphur. Summing up the results of two years' experience, he says that tumenol will be found useful in nascent eczema, erosions, excoriations, superficial ulcerations, and in different forms of pruritus.

Physiological Action of Pure and Impure Chloroform. R. du Bois-Reymond. (*Brit. Med. Journ.*, i. 1892, 209-214.) Pictet's new method of refining chloroform separates commercial chloroform into two parts, the pure material and the residue of foreign substances. Physiological experiments with these two substances led to the following results:—

1. The shape of the pulse waves and the frequency of respiration is about equally affected by both substances, the rate of respiration varying freely.

2. The pulse rate, compared in 19 cases, is higher at the close of the experiments with the residue than of those with pure chloroform.

3. The blood pressure, in by far the greater number of experiments, at the moment the respiration stops, is higher after inhalation of pure chloroform than after inhalation of the impure residue.

4. The residue causes stoppage of respiration much more quickly than pure chloroform.

Ethyl Chloride as a Local Anæsthetic. C. Rédard. (*Chemist and Druggist*, September 26th, 1891.) The author speaks highly of chloride of ethyl as a local anæsthetic. It is a colourless

mobile liquid, having a peculiar and pleasant odour, and a sweetish, burning taste. Its specific gravity is 0.9214. It is slightly soluble in water, but dissolves readily in alcohol. It is sent out for medicinal use in hermetically sealed glass tubes containing a little more than 2 drachms each. When required for use, the point of the tube is snipped off, and the warmth of the operator's hand is sufficient to cause a very fine jet of the chloride to be projected on the part to be anæsthetised. Its action is similar to that of methyl chloride.

Pental. M. Holländer. (*Chem. Repert.*, 1891, 239.) The substance reintroduced under this name by Von Mering as an anæsthetic is *amylene*, or *trimethylethylene*, and is obtained by heating amylene hydrate with acids. It is a colourless, highly volatile liquid, boiling at 36° C., insoluble in water, but readily miscible with alcohol, chloroform, and ether. It is stated to be preferable to chloroform on account of its inhalation being free from danger, and any unpleasant after-effects.

Solution of Quinine Lactate for Hypodermic Use. F. Vigier. (*Journ. de Pharm. et de Chim.*, July 1st, 1891, p. 5.) The author recommends this solution to be made by precipitating the quinine as hydrate from 21.5 grams of quinine sulphate by means of ammonia, then suspending the washed precipitate in 100 grams of hot distilled water, and gradually adding lactic acid to the mixture, while its temperature is being maintained on a water-bath until the acid is in slight excess. The solution is then allowed to cool, filtered, and the filtrate made up to 100 grams. The proportion of lactic acid required will be nearly 4.25 grams.

This solution contains one-fifth of its weight of quinine lactate, a strength which it is impossible to attain with the commercial crystallised salt, which requires from fifteen to twenty times its weight of water to form a solution.

Antidote for Morphine. M. Kossa. (*Monit. Pharm.*, December, 1891, 1007.) The antidote recommended by the author consists of a combination of picrotoxin and paraldehyde. The latter is intended to counteract the contraction of the respiratory muscles produced by the picrotoxin. The administration of picrotoxin alone does not seem to produce the desired effect.

Atropine as an Antidote to Lead. F. R. Humphrey. (*Lancet*, November 21st, 1891, 1162.) The author reports favourably on the value of atropine in cases of lead poisoning. He states that this antidote, given in full doses, rapidly relieves the colic and pain in the head, keeps the bowels freely open, assists in the return

of the bodily powers, and indirectly or directly in the removal of the lead by iodide of potassium.

Hydrogen Peroxide as an Antidote to Hydrocyanic Acid. R. Kobert. (*Pharm. Journ.*, 3rd series, xxii. 347.) The author recommends the employment of hydrogen peroxide, internally and subcutaneously administered, as an antidote in cases of poisoning with prussic acid, with which it reacts to form oxamide. Under this treatment animals survived poisonous doses of prussic acid, whilst normal animals died from the administration of hydrogen peroxide.

Potassium Permanganate as an Antidote to Phosphorus. A. Bokai. (*Rev. de thérapeutique*, No. 6, 166.) Potassium permanganate is recommended by the author as an antidote in cases of poisoning by phosphorus on account of its power of converting free phosphorus into phosphoric acid. It is employed in the form of a 1 per cent. solution, which is found to produce no injurious action on the stomach.

The Administration of Bromides. Prof. Feré. (*American Druggist*, January 1st, 1892.) As large doses of bromides sometimes induce unpleasant symptoms in consequence of a condition of sepsis in the intestinal tract, the author recommends the administration of intestinal antiseptics, like naphthol, to remove drug intolerance due to the foregoing or other cause. The following formula has given excellent results, especially in the treatment of epileptics :—

R Potassium Bromide	. . . . .	3i4
Beta-naphthol	. . . . .	5l
Salicylate of Sodium	. . . . .	54

Mix and divide into three doses, one dose to be given three times daily.

The Administration of Bromoform. P. W. Bedford. (*Pharm. Record*, February 11th, 1892.) The author states that he has found glycerine to be an excellent solvent for bromoform, and recommends the following as a serviceable formula, making a stable mixture :—

R Bromoformi	. . . . .	℥ xvi.
Alcoholis	. . . . .	℥. 5ij.
Glycerini	. . . . .	℥. 5xij.
Tincturæ Cardamomi Compositæ	. . . . .	℥. 5ij.

M.

Tincture of Jaborandi. E. H. Farr and R. Wright. (*Pharm. Journ.*, 3rd series, xxii. 1.) The authors experimented upon eleven specimens of jaborandi leaves obtained from various sources. From each of these samples tinctures were prepared with menstrua of 80, 70, 60, 50, and 40 per cent. of alcohol. The process of the British Pharmacopœia was followed in every case, and percolation was continued in every instance until the requisite volume of product had been obtained.

The following process was adopted for the estimation of the alkaloid in these tinctures:—Fifty c.c. of the sample to be assayed were introduced into a porcelain dish and evaporated over a water-bath, water being added, if necessary, until all spirit was driven off. The alkaloidal liquor was allowed to cool, 1 c.c. of semi-normal sulphuric acid added, and the solution filtered through cotton wool, the dish being rinsed with acidulated water, and the rinsings added to the filtered liquid. The latter was then rendered alkaline by the addition of 2 c.c. of B.P. liquor ammoniæ, and the liberated alkaloid taken out by agitation with two successive quantities of 15 c.c. of chloroform.

To obtain the alkaloid in a pure condition, it was withdrawn from solution in chloroform by shaking with acidulated water, 25 c.c. of distilled water being acidified with 2 c.c. of semi-normal sulphuric acid, and added in three successive portions. The mixed acid solutions were again rendered alkaline with ammonia, and shaken with two successive quantities of 15 c.c. of chloroform. The chloroformic alkaloidal solution was then agitated with a little slightly ammoniated water, and after separation was drawn off and evaporated, and the residue heated in a water-oven at 100° till the weight was constant.

The amount of mucilaginous matter present in the 40, 50, and 60 per cent. tinctures was so great as to produce emulsification of the chloroform when that liquid was shaken up with them, and it was therefore necessary to remove such matters by means of strong alcohol, before proceeding with the estimation of the tincture.

The percentage amount of extractive was ascertained by evaporating 10 c.c. of each tincture, heating the residue at 100° till the weight was constant, and multiplying the result by 10. The results of both series of estimations are embodied in the following table:—

No. of sample.	Amount of alkaloid in grams from 100 c.c. tincture.					Amount of extractive in grams from 100 c.c. tincture.				
	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.
1	·096	·104	·120	·128	·116	4·60	4·98	5·22	4·80	4·53
2	·044	·044	·052	·080	·048	3·16	3·50	3·98	4·12	4·38
3	·028	·040	·036	·032	·032	3·14	3·30	3·70	4·02	4·14
4	·092	·096	·112	·136	·132	4·36	4·76	4·98	5·36	5·32
5	·060	·072	·080	·120	·124	3·94	4·28	4·36	4·60	4·84
6	·072	·084	·088	·110	·108	2·44	2·84	3·16	3·30	3·38
7	·118	·130	·134	·140	·138	5·60	6·00	6·16	6·18	6·24
8	·032	·034	·038	·040	·038	4·12	4·68	5·32	5·54	5·64
9	·132	·152	·148	·148	·152	6·12	6·14	6·58	6·08	6·08
10	·128	·128	·138	·136	·140	5·46	6·02	6·22	6·36	6·38
11	·098	·098	·102	·108	·104	4·62	4·66	4·80	4·94	4·96
Average	·082	·089	·095	·105	·103	4·32	4·65	4·95	5·08	5·13

The above represent the mean of two estimations in each case.

These results show that a tincture of jaborandi of maximum strength may be obtained by the use of a 50 per cent. menstruum. The authors recommend the adoption of this strength of menstruum, and advocate the fixing of a standard of 0.1 per cent. of alkaloid for this tincture. They have also made a further series of experiments in order to test the comparative value, in the case of jaborandi, of the different processes in use for the preparation of tinctures. In each of these cases a 50 per cent. menstruum was employed. Their results clearly prove the decided superiority of the process of continuous percolation to those of maceration and macero-percolation.

Tincture of Belladonna. E. H. Farr and R. Wright. (*Pharm. Journ.*, 3rd series, xxii. 469-473.) In the author's experiments upon this tincture, twelve samples of belladonna leaves from various sources were operated upon. Of these eight were the produce of English, and the remaining four that of German plants. In addition to these, they obtained, for the sake of comparison, one specimen each of English and German belladonna root. All the samples were reduced to No. 20 powder, and from each a series of tinctures was prepared, with alcohol of 80, 70, 60, 50, and 40 per cent. strength (by volume). The proportion of the drug to menstruum, and also the process followed, were those of the British Pharmacopœia. The assay of the various tinctures was carried out by the following process:—

50 c.c. of each sample were evaporated in the usual way until free from spirit. The residual liquor was allowed to cool, and was then filtered through cotton wool into a separating funnel, the dish rinsed with a little water, to which 1 c.c. of semi-normal sulphuric acid had been added, the residue carefully dissolved in 10 c.c. of chloroform, and the whole transferred to the separating funnel, and the mixture well shaken. After separation the chloroform was drawn off, and the process repeated with successive quantities of 5 c.c. of chloroform until the latter came away colourless. The mixed chloroformic solutions were shaken with a little acidulated water, to remove mechanically adherent alkaloid, and the acid washings added to the contents of the separating funnel. The latter was then made alkaline by the addition of 2 c.c. of liquor ammoniæ, B.P., and the alkaloid extracted by shaking with two successive quantities of 10 c.c. each, and then with 5 c.c. of chloroform. To obtain the alkaloid in a pure condition, the mixed chloroformic solutions were shaken with acidulated water, 20 c.c. of distilled water being acidulated with 2 c.c. of

semi-normal sulphuric acid, and used in three successive portions. The acid alkaloidal solutions were separated in turn, and then mixed, the mixed liquids made alkaline with ammonia, and the alkaloid removed by agitation with two successive quantities of 10 c.c. each, and then with 5 c.c., of chloroform. The mixed chloroformic alkaloidal solutions were drawn off into a platinum dish and evaporated, and the remainder dried over a water-bath. The dish was then transferred to a desiccator, allowed to cool, and weighed. The results are given in the table on the following page.

It is thus shown that the average yield of alkaloid by the tinctures made with menstruum of different strengths is very uniform, the balance being very slightly in favour of a menstruum of low alcoholic strength. The difference, however, is so slight as to justify the conclusion that, with due care, perfect exhaustion of the drug may be effected by the use of any of the menstrua employed, and that there does not appear to be any urgent reason why the strength of the official menstruum should be altered.

The authors have also tested the comparative value of the different processes for the preparation of this tincture, and arrive at the conclusion that, while simple maceration gives the least satisfactory results, there is little to choose between the process of double maceration and one of macero-percolation, or continuous percolation, the probability being that with the proportions of drug and menstruum ordered in the B.P., perfect exhaustion may be effected by the use of either of these processes.

In the author's opinion, the alkaloid standard of this tincture should be fixed not lower than 0.25 per cent.

Tincture of Stramonium Seeds. E. H. Farr and R. Wright. (*Pharm. Journ.*, 3rd series, xxii. 569-573.) Eleven specimens of stramonium seeds were obtained, and a series of tinctures made from each by the B.P. process, with menstrua of 80, 70, 60, 50, and 40 per cent. strength (by volume). All the tinctures became opalescent when kept, and threw down a more or less abundant deposit. The latter varied greatly in appearance, that from the 80 and 70 per cent. tinctures apparently consisting of fatty matter in a semi-transparent crystalline condition, while the deposit from the tinctures of lower alcoholic strength was darker in colour, and appeared to partake more of a resinous character.

In addition to the seed tinctures, the authors also prepared, for the purpose of comparison, three series of tinctures from the leaves, menstrua of the same alcoholic strength and the same

No. of sample.	Amount of alkaloid in grams from 100 c.c. tincture.					Amount of extractive in grams from 100 c.c. tincture.				
	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.
1	·024	·025	·026	·028	·028	·925	·940	·950	·975	·925
2	·024	·024	·024	·026	·023	1·36	1·24	1·30	1·20	1·28
3	·026	·025	·026	·025	·025	1·32	1·45	1·45	1·47	1·42
4	·026	·024	·026	·025	·026	1·06	1·16	1·14	1·18	1·14
5	·042	·045	·044	·043	·045	1·42	1·52	1·54	1·50	1·58
6	·0205	·020	·021	·020	·021	1·44	1·52	1·52	1·54	1·52
7	·020	·020	·021	·021	·020	1·14	1·40	1·44	1·38	1·42
8	·0395	·011	·0385	·0395	·039	1·44	1·50	1·48	1·54	1·54
9	·017	·016	·016	·018	·017	·725	·850	·925	1·01	1·00
10	·014	·014	·015	·015	·013	0·70	·82	·90	·94	·88
11	·020	·020	·021	·021	·022	0·90	1·00	1·10	1·20	1·22
12	·015	·016	·017	·016	·016	0·92	1·04	1·14	1·14	1·08
Average	·024	·024	·0246	·0248	·0246	1·112	1·20	1·24	1·24	1·23
<i>Root Tinctures.</i>										
German	·020	·020	·021	·020	·019	·725	·775	·802	·851	·854
English	·0305	·032	·0305	·030	·0265	1·40	1·46	1·18	1·46	1·54

Series 9 to 12 were prepared from German leaves.—Each result represents the mean of Two Estimations.

proportion of drug to menstruum being used as in the case of the seed tinctures.

The following process was adopted for the assay of these tinctures :—

Fifty c.c. of the tincture to be estimated are introduced into a porcelain dish, and evaporated over a water-bath to low bulk, water being added, if necessary, until all the spirit is removed. The residual liquor is allowed to cool, and is then acidified by the addition of 1 c.c. of semi-normal sulphuric acid, and the liquid filtered through cotton wool into a separating funnel. The dish and filter are rinsed first with a little acidulated water, and then with 15 c.c. of chloroform, the rinsings added to the contents of the funnel, and the whole well shaken. After separation the chloroform is drawn off, and the process repeated with 10 c.c. of chloroform. The washings are mixed and freed from traces of alkaloid by shaking with three successive small portions of acidulated water, and these are separated and added to the original solution. The latter is then made alkaline with ammonia, and the alkaloids extracted with three successive quantities of chloroform of 15 c.c. each. To obtain the alkaloids in a pure condition, they are withdrawn from solution in chloroform by agitation with three successive small portions of acidulated water, the mixed acid solutions made alkaline with ammonia, and the alkaloids taken out by agitation first with 10 c.c., and then with two successive quantities of chloroform of 5 c.c. each. In cases where the final acidified aqueous solution was not colourless, the process of shaking out was repeated. The mixed chloroformic alkaloidal solutions were afterwards shaken with ammoniated water, and after separation were drawn off and evaporated over a water-bath, and the alkaloidal residue heated at 100° until the weight was constant.

The above process was found to be applicable to the majority of the tinctures without any modification, but with others some difficulty was experienced, arising from the fact that in many specimens of stramonium seeds there seems to exist some substance soluble both in alcohol and water, and not removable by chloroform, either from an acid or alkaline liquid, and which possesses the property of emulsifying chloroform when that liquid is shaken up with a solution containing it. No difficulty was experienced in removing the oil and colouring matter, but when the extract was made alkaline, and shaken with chloroform, emulsification took place, and the chloroform refused to separate out clear, even after

standing for some hours. Separation into two layers did, however, take place, the upper layer consisting of a brown alkaline mother liquor, and the lower layer of emulsified chloroform containing the alkaloid in solution, and holding in suspension some of the mother liquor. The following modification was found to give reliable results, and to shorten materially the time occupied by each estimation. The chloroform magma is introduced into a separating funnel and shaken vigorously, when, as a rule, about half the chloroform separates out and can be run off. To the remaining emulsion 5 c.c. of 90 per cent. alcohol is added, and the whole well shaken and then allowed to stand, when a perfect separation into two layers takes place, the lower layer consisting of chloroform and alcohol, and the upper layer of a brown alkaline aqueous liquid. The whole of the alkaloid is taken out by the chloroform. The latter is drawn off and added to the portion previously separated, and the alkaloid extracted by shaking with three portions of acidulated water. The acid solutions are mixed and made alkaline, and the alkaloids recovered by means of chloroform. This process is once repeated, and the final chloroform solution, after shaking with ammoniated water, is drawn off and evaporated, and the residue dried at 100° and weighed.

The results of the assay of the various tinctures are given in the table on the following page.

These results show that the amount of alkaloid in stramonium seeds does not vary to anything like the same extent as that of most other drugs, and that the tincture, like those of henbane and belladonna, readily admits of standardization. In the authors' opinion, the standard should be fixed not lower than .025 per cent.

It is further seen from this table that the most perfect exhaustion of stramonium seeds is effected by the use of a 60 or 70 per cent. menstruum. It is open to question, however, whether a better preparation could not be obtained from the leaves. The chief objections to the tincture prepared from the seeds are that it almost invariably becomes turbid, and deposits when kept, and also becomes opaque on dilution, which objections do not apply to a 50 per cent. tincture of the leaves. Should further experiments confirm the conclusion arrived at by Lyons that the alkaloidal strength of the seeds and leaves is the same, the authors would recommend that these tinctures, like those of henbane and belladonna, be prepared from the leaves, on the ground that a 50 per cent. tincture of the leaves is a more elegant pharmaceutical product than a 60 per cent. tincture of the seeds.

Quantitative Results of Estimation of Samples of Tincture of Stramonium Seeds.

No. of sample.	Amount of alkaloid in grams from 100 c.c. tincture.					Amount of extractive in grams from 100 c.c. tincture.				
	50 p. c. tincture.	70 p. c. tincture.	80 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	50 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	30 p. c. tincture.
1	·030	·034	·032	·030	·030	·52	·54	·60	·61	·61
2	·024	·026	·026	·024	·023	·52	·56	·56	·55	·55
3	·021	·024	·023	·024	·017	·46	·51	·52	·60	·60
4	·030	·028	·027	·030	·029	·49	·54	·52	·50	·50
5	·028	·029	·028	·028	·026	·50	·64	·78	·70	·70
6	·025	·024	·025	·024	·018	·72	·74	·78	·80	·80
7	·026	·027	·026	·023	·021	2·50	1·18	·90	·74	·74
8	·021	·025	·021	·019	·020	1·44	1·34	·92	·70	·70
9	·018	·019	·020	·015	·014	1·00	·96	·68	·60	·60
10	·020	·023	·024	·021	·015	1·34	·88	·74	·58	·58
11	·021	·025	·023	·020	·018	1·02	·77	·67	·61	·61
Average	·0255	·0258	·0256	·0234	·0209	1·02	·90	·67	·61	·61

<i>Results of Estimation of Leaf Tinctures.</i>				
1	·015	·014	·013	1·60
2	·028	·028	·028	2·04
3	·022	·022	·022	1·90
Average	·015	·014	·013	1·60

Series No. 3 was made from seeds gathered in 1899.

An experimental comparison of four different processes for the preparation of tincture of stramonium seeds—viz., simple maceration, double maceration, the B.P. process (maceration and percolation), and continuous percolation—leads the authors to infer that perfect exhaustion of the drug may be effected either by the B.P. process, or by that of continuous percolation.

Tinctures of Ipecacuanha. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxii. 417.) The author has experimented on the production of tinctures of ipecacuanha in accordance with the formula suggested by W. H. Symons (*Year-Book of Pharmacy*, 1891, 397), as well as with spirit of wine of other percentage strengths. The method suggested consists in percolating 1 oz. of ipecacuanha, previously mixed with 1 drachm of a 10 per cent. solution of ammonia, with alcohol of 10 per cent. strength, a possible modification of which to 20 per cent. has been more recently suggested in a communication by W. H. Symons to the *Chemist and Druggist* (Sept. 12th, 1891).

The sample of ipecacuanha on which the author's experiments were carried out, estimated by the process described by Mr. Ransom (*Pharm. Journ.* [3], xviii. 241), was found to contain 1.65 per cent. of emetine, coinciding with the yield of alkaloid which he obtained as the average of ten samples from different sources. The following table indicates the relative alkaloidal value of tinctures made with alcohol of various strengths:—

	Alcohol, percentage by weight.	Percentage of alkaloid left in marc.	Percentage of total alkaloid (1.66) unex- tracted.
	Per cent.	Per cent.	Per cent.
One ounce of ipecacuanha first moistened with 1 drachm of 10 per cent. ammonia . . .	10	0.42	25.3
	15	0.28	16.8
	20	0.28	16.8
	30	0.16	9.7
	49 (proof)	0.09	5.4
	84 (rect.)	0.08	4.8
Percolating with one-half- menstruum, then adding 1 dr. 10 per cent. ammonia and percolating with re- mainder of alcohol . . .	10	0.32	19.2

From these figures it will be seen that spirit of wine of 10, 15, 20, and 30 per cent. strength (in combination with ammonia, 1

drachm to 1 oz. of ipecacuanha) only imperfectly extracts the alkaloid from ipecacuanha, more perfect solution of the emetine being effected if the drug be first percolated with half of the menstruum, then the ammonia added, and percolation completed with the remaining half.

Of the tinctures that may be taken to represent the full alkaloidal activity of the drug, that made with proof spirit deposits on standing; but the rectified spirit tincture—viz., one prepared by percolating 1 ounce of crushed ipecacuanha, moistened with 1 drachm of a 10 per cent. solution of ammonia, with sufficient rectified spirit to produce 1 pint—is bright, and remains so on dilution with water.

Tincture of Musk. M. Vander Voorst. (*National Druggist*, from *Journ. de Pharm. d'Anvers*.) The author calls attention to the great differences in the strength of tincture of musk of the various pharmacopœias, and the inconvenience arising from this great variation. He also shows that in order to obtain a tincture containing the highest possible percentage of the active principles of musk, the alcoholic menstruum should not be stronger than 50 per cent.

Deposit from Tincture of Sanguinaria, U.S.P. F. Krauss. (*Amer. Journ. Pharm.*, October, 1891.) This tincture, when kept for a few weeks, deposits on the sides of the vessels a reddish film consisting of a resinous body. By means of water rendered alkaline with caustic soda or potash it can be detached from the vessels. The substance thus obtained, after removing the alkali by washing with water and acidulated water, has been examined by the author.

It forms a reddish-black, shining, resinous powder, very slightly soluble in ether and alcohol. It is much more soluble in chloroform and spirit of chloroform, yielding solutions of a red colour. When heated it burns with a bright flame without melting, and leaves a black char. It is insoluble in hydrochloric acid, completely soluble, however, in concentrated sulphuric acid, forming a very dark-red solution from which the resin is entirely precipitated as a flocculent, red powder, on the further addition of a quantity of water. On allowing the liquid to stand, the resin rises to the top, leaving a colourless solution at the bottom. The resin is also soluble in nitric acid, from which it is only partly precipitated on the addition of water. After this separation the liquid is still highly coloured.

Pepsin Wine. J. Clark. (*Pharm. Journ.*, 3rd series, xxii. 597-599.) The author arrives at the conclusion that the proportion of alcohol present in sherry wine does not appreciably affect the digestive power of pepsin. On the strength of his experiments he recommends the following formula:—

Pepsin, soluble scale	320 grains.
Distilled Water	3 ounces.
Glycerine	2 „
Strong Hydrochloric Acid	2 drachms.
Sherry Wine, detannated, B.P.C. to make	1 pint.

Mix together the acid and the water, and dissolve the pepsin in the mixture. Then add the glycerine, and make up to a pint with the sherry wine. Allow to stand for three days and filter. The following test should also be appended to the formula:—Three minims of this preparation will completely digest 100 grains of coagulated white of egg in 1 ounce of water, acidulated with 5 minims of hydrochloric acid, in less than thirty minutes at 130° F.

The author does not, however, wish it to be understood that 1 drachm of the same preparation would completely digest or render soluble 2,000 grains in the amount of water recommended in the *Pharmacopœia*. He is of opinion that in testing this or any pepsin preparation, the aim should be to ascertain what quantity is required to completely digest a given weight of albumen *in a given quantity of water*, and not what weight of albumen will be digested by a given quantity of the preparation *in an excessive quantity of water*. While the *Pharmacopœia* test is designed to show the *least* that a pepsin ought to do, the author's test is meant to show the *full digestive power* of the sample.

The Purity of Extracts. W. Watson Will. (*Chemist and Druggist*, February 27th, 1892.) The author found that all the green extracts examined by him contained copper—belladonna as much as .42 per cent., and henbane as much as .36 per cent. The extracts containing the largest percentage of copper were belladonna, henbane, ergot, cannabis indica, and cinchona; then came aconite, lactuca, conium, pareira, and cimicifuga; and, finally, chamomile, cascara, and taraxacum. A sample of acetic extract of ipecacuanha contained a high percentage of copper. He suggests the application of nickel or well-enamelled vessels in the place of the copper ones now so commonly used in the preparation of extracts.

Assay of Extracts. H. Beckurts. (*Apoth. Zeitung*, 1891, 537; *Amer. Journ. Pharm.*, January, 1892.)

Extract of Nux Vomica.—2 grams of the triturated extract are agitated with 5 c.c. of water of ammonia, 5 c.c. of water, and 10 c.c. of alcohol until solution is effected; the solution is then shaken with three portions of chloroform, 20 c.c., 10 c.c., and 10 c.c. The united chloroform solutions are evaporated or the chloroform distilled off, the residue warmed upon a water-bath for several minutes with 15 c.c. of $\frac{n}{10}$ hydrochloric acid, then filtered, and the filter thoroughly washed. The filtrate is titrated with $\frac{n}{1000}$ alkali, using cochineal as the indicator; if the number of c.c. of alkali be subtracted from 150 (corresponding to 15 c.c. of $\frac{n}{10}$ acid), and the remainder multiplied by 0.00364 (assuming that the alkaloids are present in equal amounts), the product will represent the total alkaloids present in 2 grams of extract; multiplying this by fifty will give the percentage.

Extract of Belladonna, Aconite, Hyoscyamus, etc.—2.5 grams of extract are dissolved in 3 c.c. of alcohol and 6 c.c. of water; the solution is rendered alkaline by addition of 1 c.c. of water of ammonia, and then agitated with three portions of chloroform, 20 c.c., 10 c.c., and 10 c.c.; after distilling off the chloroform, the residue is warmed upon a water-bath for a few minutes with 5 c.c. of $\frac{n}{10}$ hydrochloric acid, filtered, the filter washed with water, and the filtrate titrated with $\frac{n}{1000}$ alkali (cochineal as indicator). By subtracting the number of c.c. necessary to neutralize from 50 (corresponding to the 5 c.c. of acid), and multiplying the remainder by the following factors, the weight of alkaloid in 2.5 grams is ascertained: for atropine and hyoscyamine, 0.00289; for aconitine, 0.00533.

Extracts containing Chlorophyll.—5 grams of extract are dissolved in 50 c.c. of dilute alcohol, a slight excess of baryta water added, diluted to 150 c.c.; after standing, the supernatant liquid is filtered, the excess of baryta in the filtrate is precipitated by a current of carbon dioxide; after filtering, 75 c.c. (representing 2.5 grams of extract) are evaporated to a syrupy consistence, and dissolved in a mixture of 6 c.c. of water, 3 c.c. of alcohol, and 1 c.c. of water of ammonia; the solution is extracted with three portions of chloroform, etc., as above.

Dry extracts containing Powdered Glycyrrhiza.—5 grams of extract are exhausted with 100 c.c. of diluted alcohol; to 80 c.c. of the filtrate a slight excess of baryta water is added and diluted to 150 c.c.; after clearing, the supernatant liquid is filtered, the excess

sive baryta removed from the filtrate with carbon dioxide, again filtered, and 75 c.c. of the filtrate (representing 2.5 grams of extract) extracted with three portions of chloroform, etc., as above.

It is claimed for these methods that all the alkaloid is extracted by the chloroform in the presence of alcohol, and that the emulsifying is avoided by the presence of the dilute alcohol.

Miscible Liquid Extract of Cascara. (*Pharm. Journ.*, 3rd series, xxii. 701 and 788.) J. Moss reports upon some experiments conducted with a view to avoiding the deposition which takes place in making the official liquid extract. It was found possible to make a preparation of full activity, which did not turn muddy when mixed with water, and from which the nauseous taste and smell were entirely eliminated, by simply exhausting young bark with water alone, evaporating on a water-bath until a brittle residue was left, and treating the cooled extract with cold water until disintegrated. The liquid was strained through flannel, the product from each pound of bark evaporated to 12 fluid ounces, and 4 fluid ounces of rectified spirit added.

The solid extract may be prepared by proceeding as above, except that instead of adding spirit to the strained liquor the latter should be evaporated to the necessary consistency on a water-bath.

G. Spencer, dealing with the same subject, suggests the following formula:—

Cascara Sagrada, in coarse powder	. . . . .	1 pound.
Cold Water	. . . . .	1 gallon.
Carbonate of Ammonia	. . . . .	1 ounce.

Dissolve the carbonate of ammonia in the water, and digest the cascara in it for three days. Transfer to a percolator, and after the liquid has ceased dropping, percolate with 2 more pints of water to exhaust. Evaporate down to 12 ounces, and when cold add spirit to 16 ounces and filter.

In the process of evaporation the carbonate of ammonia becomes dissipated, and the result is a fluid extract, perfectly miscible with water, of full activity, and not so nauseous as that of the B.P.

The substitution of 1 ounce of spirit of chloroform for the rectified spirit in the B.P. extract is stated to mask all nauseousness, and to render this preparation a thoroughly palatable one.

Fluid Extract of Cascara Sagrada. N. J. Pritzker. (*Chemist and Druggist*, June 4th, 1892.) The author states that a menstruum made in the proportion of 25 parts of rectified spirit, 65

parts of water, and 10 of ammonia solution, gives a fluid extract of dark-red colour, without any precipitate. It mixes in all proportions without precipitate with water, has no odour or taste of ammonia, is much less disagreeable in taste than without the use of ammonia, and the product is promptly active in a dose of 15 minims.

Extract of Belladonna. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxii. 364.) The author's examination of a number of trade specimens of this extract, reveals a great variation both in their physical characters and their alkaloidal value. The results are shown in the following table:—

Extract.	No.	Loss at 100° C.	Alkaloid calculated on dried extract.	Extract soluble in collod. bellad., B.P.C. process.	Alkaloid from extract in collod. bellad., B.P.C. process.	Alkaloid undissolved (by difference).
Rad. alcoholic, B.P.	1	14.7	P. c. 3.98	P. c. 21.27	P. c. 1.36	P. c. 2.62
Rad. alcoholic, B.P.	2	12.1	3.57	16.85	1.37	2.2
Rad. alcoholic, B.P.	3	21.4	0.76	5.13	Too small for estimation.	—
Bellad., B.P.	1	23.79	1.2	4.46	"	—
"	2	25.1	1.26	2.92	"	—
"	3	21.5	0.94	3.6	"	—
Fol. alcoholic.	1	10.5	0.81	85.0	P. c. 0.80	—
"	2	17.5	2.07	21.9	0.75	1.32
"	3	15.3	2.90	38.15	1.32	1.58

Collodium Belladonnæ, B.P.C. M. Conroy. (*Pharm. Journ.*, 3rd series, xxii. 327.) The author points out that in making this preparation according to the B.P.C. formula, the extract of belladonna, though at first dissolved by the spirit of camphor, is mostly thrown out again on the addition of the flexible collodion, and that the settling of the mixture takes a very long time owing to its viscous nature. He tried the following modification, with the result that a perfectly clear preparation was obtained in a very short time.

The extract was dissolved in the spirit of camphor, but, instead of adding the collodion to it as directed by the formulary, ether and spirit, in the proportions used in making collodion, were added. In other words, a mixture consisting of three parts of

ether and one part of rectified spirit was used instead of collodion. This was shaken up at frequent intervals during the course of one hour, and the clear solution poured off. In this perfectly clear solution, the necessary amounts of pyroxylin, Canada balsam, and castor oil were dissolved. This produced an article identical with the B.P.C. formula without requiring the inconvenient and tedious settling process. The essential difference between this modification and the original formula is that the pyroxylin is added to an easily obtained and bright solution of the extract instead of the extract being added to the collodion.

The author admits, however, that nothing but speed is gained by this modification, and that it shares with the unaltered formula the defect of leaving most of the extract undissolved. He found that out of 2187.5 grains of extract used, only 2.43 grains were actually dissolved, as much as 1903.2 grains being left insoluble. The alkaloid extracted from the liquid portion amounted to 23.44 grains, and that from the undissolved extract to 26.92 grains, thus showing a loss of more than half.

Since the extract of belladonna of the British Pharmacopœia is not in reality an alcoholic extract, the author prepared an extract entirely with rectified spirit, and with this he repeated the above experiments, this time with the following results:—Out of 2187.5 grains of extract used, only 409.2 grains passed into solution, leaving 1778.3 grains undissolved. The alkaloid extracted from the dissolved portion amounted to 31.8, and that from the undissolved extract to 51.3 grains.

Some Pharmaceutical Uses of Extract of Malt. J. Gordon. (*Amer. Journ. Pharm.*, July, 1891.) Extract of malt is found to answer well in the preparation of an emulsion of naphthalin. After reducing the latter in a mortar to a very fine powder, a definite quantity of malt extract is added gradually and well triturated with it until a perfectly smooth mixture is obtained. The substance is now suspended, but the mixture is too thick to pour well from a bottle; it is then diluted by the addition of an equal volume of syrup of wild cherry, which not only renders the mixture fluid enough to pour out easily, but also imparts to it an agreeable flavour. The higher specific gravity of the malt extract causes the particles of the naphthalin to remain suspended, and its viscosity, even when diluted one-half, is sufficient to prevent it from floating on the top until after standing for some time, when slight agitation will restore a uniform mixture.

With tincture of guaiac a good emulsion can be made by stirring

together equal measures of extract of malt and syrup, and then adding the tincture gradually. The mixture obtained in this way does not assume the bluish colour of the gum emulsion. After standing for a day it separates into two layers, the lower transparent and bright, the upper one having a slightly curdled appearance, but a slight shake of the bottle suffices to cause the layers to mix intimately again.

With resin of guaiac the method is slightly different. The resin should be first rubbed thoroughly in a mortar with the extract of malt until a smooth paste is obtained, after which sufficient of the syrup of wild cherry is added to make the mixture fluid enough.

With tincture of asafœtida a mixture is obtained in the same manner as with tincture of guaiac. But for the preparation of an emulsion from the gum resin, it is best first of all to incorporate the latter in a mortar with a small quantity of hot water to form a paste, and then to add the malt and syrup alternately in small portions; it can easily be made to contain 8 per cent.—double the strength of the U.S.P. *Mistura Asafœtidæ*. An advantage of this over the official mixture is, that it does not have the exceedingly disagreeable smell of the latter, and the taste is less unpleasant. Like the mixtures mentioned before, the addition of water renders it opaque.

For the administration of the tincture and fluid extract of *cannabis indica*, malt extract answers very well; with these preparations the best result was obtained with the following proportions:—

Tincturæ cannabis indicæ	℥ss.
Extracti malti	℥j.
Syrupi pruni virginianæ	℥ss.

With copaiva it is necessary to proceed much the same as in making an ordinary emulsion, starting with a small portion of the extract of malt in a mortar, and adding with trituration alternately portions of copaiva, malt, and syrup. The mixture retains about the colour of the malt, and forms two layers on standing, but is easily restored by agitation. With other resinous tinctures and fluid extracts the results are similar to those already described.

Extract of malt as prepared by the U.S.P. official process, or as found in the market prepared by the various manufacturers, is in itself too thick to dispense as a vehicle, hence it is necessary

to use a diluent of some kind. The author has selected the syrup of wild cherry for the purpose, on account of its agreeable taste and slight odour of hydrocyanic acid. With extract of malt made according to the direction of the U.S.P., results were obtained identical with those from the commercial extracts; about the only difference noticed was in the colour of the mixtures, some of the commercial extracts being of a darker colour.

Concentrated Infusion of Senega. A. G. Hendry. (*Pharm. Journ.*, 3rd series, xxii. 663.) Commercial samples of this infusion are stated to suffer from the following defects: they are often dark coloured and strongly alkaline (in which case there is probably little or no deposit), and they do not, when diluted, fairly represent the fresh article nor contain a sufficient quantity of the active principle of the drug.

The following process is stated to give the best results:—Let the drug be well ground or bruised, and macerated for an hour or two with sufficient water to thoroughly damp it at a temperature not exceeding 104° F. Then pack firmly in a series of suitable percolators, and allow percolation to proceed, adding cold water to the first percolator when necessary and passing the percolate from it through the others till the drug is exhausted. With care and working on a sufficiently large quantity no evaporation should be required, but if necessary it must be conducted at as low a temperature as possible. Finally, add about 35 fluid ounces (less in winter) of rectified spirit to each gallon, and filter. Heat and the application of alkalis are to be avoided.

Concentrated Acid Infusion of Roses. A. G. Hendry. (*Pharm. Journ.*, 3rd series, xxii. 664.) The object of the author's notice is to suggest a process giving little trouble, and producing an article which, when diluted with seven times its volume of water, forms an infusion fairly representing the fresh preparation made according to the Pharmacopœia. The process is as follows:—Take of red rose petals, dried and broken up, 2 pounds; place in a stone-ware jar, and add 5 or 6 pints of water, at a temperature of from 150° to 160° F., previously mixed with 16 fluid ounces of diluted sulphuric acid. Cover well, and allow to stand till nearly or quite cold. Pack in a suitable glass percolator, and percolate with cold water till exhausted. In working with large quantities the petals may be distributed over several percolators and the liquid passed through all. Evaporate if necessary to a suitable volume, taking care to reserve a considerable quantity of the stronger liquor, to

which the other may be added when evaporation is complete. About 30 fluid ounces of rectified spirit to each gallon is necessary for preservation.

Cause of the Gelatinization of Infusion of Digitalis. W. Bräutigam. (*Pharm. Zeitung*, 1891, 349.) The author claims to have traced the cause of this gelatinization to a micro-organism, which he has been able to separate and cultivate. It is described by him under the name *bacillus galatinogenus*, and stated to develop both in alkaline and acid media. The cultures were made by using an infusion of digitalis containing 5 per cent. of simple syrup and 7 per cent. of gelatin as the nutritive medium. If a little of this culture is added to sterilized infusion of digitalis containing a small proportion of sugar, gelatinization takes place in a few days. In the absence of sugar, the infusion thickens, but is not converted into a jelly.

Liquor Strychninæ Hydrochloratis, B.P. W. Duncan. (*Pharm. Journ.*, 3rd series, xxii. 843-844.) The author's investigation was undertaken with the object of determining the cause of the separation of crystals so often observed in this preparation. The results of his experiments point to the following conclusions:—

1. The official solution is stable at ordinary temperatures, and even at 0° C. if made by the first formula.
2. The solution made by the alternative or "part" formula is not stable when the temperature falls much below the normal.
3. The addition of rectified spirit checks the liability of acid solutions to crystallize when the temperature falls.
4. The separation of crystals at normal and especially at lower temperatures is due entirely to the presence of free hydrochloric acid, and the degree to which crystallization proceeds is proportional to the excess of acid present within certain limits.

Any risk of crystallization may therefore be avoided by using the theoretical quantity of hydrochloric acid to form a neutral salt, which will be 10 minims of the dilute acid to 9 grains of strychnine, or 1·01 part to 1 part. Another equally good plan is stated to consist in the use of strychnine hydrochloride without the addition of any acid.

The author's results are fully confirmed by B. H. Paul (*Pharm. Journ.*, p. 880).

Liquor Bismuthi et Ammoniac Citratis. A. G. Hendry. (*Pharm. Journ.*, 3rd series, xxii. 663.) The author finds that the discoloration often observed in this preparation may be lessened by

employing more water for rubbing up the citrate than the *Pharmacopœia* directs. The quantity of water should be sufficient to form a thick cream with the citrate. But in order to get entirely rid of the coloration, it is necessary to filter the liquor through a small quantity of purified animal charcoal.

The liability of this liquor to turn cloudy may be avoided by adding a few crystals of citric acid to the bismuth citrate, and using sufficient ammonia to leave the liquor distinctly alkaline.

Improved Formula for Injectio Morphinae Hypodermica. J. G. Sharp. (*Pharm. Journ.*, 3rd series, xxii. 848.) The formula recommended is as follows:—

Take of—

Acetate or Hydrochlorate of Morphine	24 grains.
Glycerine	3 fluid drachms.
Rectified Spirit	1 fluid drachm.
Distilled Water, sufficient to make	1 fluid ounce.

Mix, dissolve in the cold, and filter.

This makes a preparation of the strength of 1 grain in 20 minims, or one half the strength of the present official injectio morphinae hypodermica. Five minims, therefore, represent $\frac{1}{4}$ of a grain. In this preparation the glycerine, as a hygroscopic body, keeps the piston of the syringe moist, and thus prevents the instrument from getting out of working order.

The Coating of Iron Pills. H. Wyatt. (*Chemist and Druggist*, October 24th, 1891.) The author recommends the following coating as very suitable for Blaud's pills and iron pills in general. It consists of a thin film of graphite or plumbago applied in the following manner:—The pills are shaken up in a box with powdered graphite until they are uniformly black, after which they are transferred to a covered glazed-ware pot, or for large quantities to a Symes pill-coater, and rotated with some force until a bright metallic lustre is obtained.

So finished, Blaud's pills are effectually protected from oxidation, and are not materially increased in size.

Note on Official Iodine Preparations. W. G. Mackenzie. (*Pharm. Journ.*, 3rd series, xxii. 602.) The author recommends the following directions for the preparation of liniment and tincture of iodine. By their observance complete solution of the iodine can be effected in a few minutes without the use of a mortar.

Linimentum Iodi.

Take of—

Iodine	1½ ounce.
Iodide of Potassium	¾ "
Distilled Water	1 fluid "
Glycerine	¼ "
Rectified Spirit	9 fluid ounces.

Add the iodine and iodide of potassium to the water and glycerine, previously mixed. Allow to stand, without agitation, till dissolved; then add the spirit and shake together.

Tinctura Iodi.

Take of—

Iodine	½ ounce.
Iodide of Potassium	¼ "
Distilled Water	1 fluid "
Rectified Spirit	19 ,, ounces.

Add the iodine and iodide of potassium to the water. Allow to stand, without agitation, till dissolved; then add the spirit and shake together.

In the case of liquor iodi and the volumetric solution of iodine, it is only necessary to suggest that the directions read, "Add the iodine and iodide of potassium to an equivalent weight of water, allow to stand, without agitation, till dissolved, and dilute with water to the required volume."

A similar process may be adopted for dispensing a frequently prescribed iodine preparation known as Morton's iodo-glycerine solution, the formula for which, as given by Martindale and Squire, is—

Iodine	10 grains.
Iodide of Potassium	30 "
Glycerine	1 ounce.

By adding 25 minims of water to the iodine and iodide of potassium, allowing it to stand till dissolved, and making up to 1 ounce with glycerine, a perfect preparation is obtained in a very few minutes.

The author thinks there cannot be any objection on therapeutic or pharmaceutical grounds to the substitution of a small quantity of water for rectified spirit in the official liniment and tincture, or to the slight addition to the quantity of potassium iodide in the case of the former preparation, this addition being necessary to

effect solution of the iodine in the quantity of water suggested by him.

A Combination of Iodine with Glucose. F. P. Mann. (*American Druggist*, September, 1891.) The author points out that glucose is an agent capable of absorbing, or rather of occluding, free iodine so that this element cannot be detected by either odour or taste, and thus combined can be administered in much larger doses than formerly employed without producing unpleasant symptoms. The following is given as a working formula:—

Iodine	1 drachm.
Iodide of Potassium	2½ drachms.
Water	4 ounces.
Glucose	12 „
Essence of Wintergreen	2 drachms.

The mixture is allowed to stand for twelve hours or until the occlusion of the free iodine is complete.

A teaspoonful is to be taken with a little water between meals.

Simple syrup cannot be substituted for glucose, as it fails to absorb the free iodine.

Volatilization of Mercury from Mercurial Ointment. M. Kunkel. (*American Druggist*, May 15th, 1892.) The author has made experiments on the volatilization of mercury from mercurial ointment. He coated the bottom of a shallow, hermetically fitting box with a layer of mercurial ointment, and then conducted warmed air through it. The vapours were passed through long absorption tubes containing glass wool impregnated with concentrated nitric acid. It was found that a cubic metre of air carried over between 10 and 18 milligrams of mercury. From this it may be concluded that during the preparation of mercurial ointment in open vessels (mortars, etc.) a certain amount of mercury may find its way into the respiratory passages of the workmen.

NOTES AND FORMULÆ.

PART III.

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Preservation of Fruit Juices. M. Dhamelincourt. (*Journ. de Pharm. et de Chim.*, December, 1891, 501.) The clarified juice is heated to boiling in a copper vessel and then poured into a dish. Meanwhile the bottles are provided with stoppers, and are then gradually filled, a space of about two centimeters in the neck being left empty; some alcohol is then poured upon the hot liquid, and the bottle is quickly stoppered, the cork being further secured as the liquid cools. The alcohol which evaporates into the empty space is sufficient for the preservation of the liquid. The juices of fresh herbs may be preserved in the same manner.

Detection of Pathogenic Bacilli in Milk. K. Ilkewitsch. (*München. Med. Wochenschrift*; *Chem. News*, vol. 66, 37.) For detecting the bacilli of tubercle in milk, 20 c.c. of the specimen are coagulated with dilute citric acid, the whey is removed, and the casein inclosing the bacilli is dissolved in a solution of sodium phosphate. The solution thus obtained is well shaken up with 6 c.c. of ether to counteract the action of the fat globules upon the bacilli, the mixture allowed to stand for the evaporation of the ether, and whizzed by means of a modified "lacto-krit" (3,600 revolutions per minute). The vessel for the reception of the milk consists of a copper tube, for the bottom of which there is substituted a little basin ground to fit, into which, after the end of the centrifugal process, there is let down a minute copper globe not reaching quite to the bottom (distance 3 m.m.) in order to cover the sediment in the basin. If the centrifugal process does not last longer than fifteen minutes, the great majority of the bacilli in the coagulum sink to the bottom of the basin. The copper globe secured to a thread is now let down to the bottom, the supernatant liquid is poured away, the sediment is taken out, distributed into several glasses, stained according to the Ziehl process, and examined with the microscope. With the aid of this method the presence of the bacilli of tubercle were

detected with certainty in milk, even when the method of infection gave no results.

Identification of Tubercle Bacillus. P. Kaufmann. (*Lancet*, No. 3586, 1156.) The author recommends the following simplified process:—The sputum is dried and fixed on a cover glass, then stained with hot carbol fuchsin as usual. The cover is next moved to and fro in water at a temperature between 208° and 212° F., during one to three minutes. The specimen may now be mounted in water and examined forthwith, or it may be double stained if thought necessary. In order to obtain good results the film must be as thin as possible and evenly distributed.

Protection against the Tubercle Bacillus. M.M. Héricourt and Richet. (From the *Lancet*.) The authors' experiments seem to indicate that the presence of the avine variety of this bacillus is inimical to the growth and development of that affecting man. Of four dogs inoculated with cultures of human tubercle, two that had previously received an intra-venous injection of bird-tubercle were alive and well 122 days after the experiment, whilst the others died in twenty-two days.

The Influenza Bacillus. L. Pfeiffer. (*Pharm. Journ.*, 3rd series, xxii. 791.) The specific bacilli reported on by the author were found only in cases of influenza. Their presence kept equal pace with the course of the disease, and disappeared as the bronchial secretion was checked. They appeared as very tiny rodlets as thick as the bacilli of mouse septicæmia, but only half as long. Three or four might often be seen forming a chain. Basic aniline dyes stained them with some difficulty, dilute Ziehl's solution and hot Loeffler's methylene blue making better preparations, whilst Gram's method had no effect. The two ends of the bacilli stained more intensely than the rest, so that the organisms almost seemed to be double. This explains how former observers were misled, and described them as *diplococci* or *streptococci*. In hanging drops they were immobile. It was possible to obtain pure cultures, the colonies on agar-agar appearing as minute droplets, clear as water. Apes and rabbits were successfully inoculated.

The length of this bacillus is about one-twentieth of the diameter of a red blood-corpuscle.

The Bacillus of Measles. Drs. Canon and Pielicke. (*Berlin. Klin. Wochenschr.*; *Brit. Med. Journ.*, 1892, 868.) These bacilli are described as very variable in size, some of them being as long as

half the diameter of a red blood-corpuscle, while others are very small and somewhat of the appearance of diplococci. Methylene blue stains them much more at the ends than in the middle. They have been found in the blood, expectoration, and nasal mucus of patients suffering from measles.

Resistance of *Penicillium Glaucum* to Bichloride of Mercury. H. W. Russell. (*Amer. Bot. Gaz.*) The destructive action to fungoid life of even minute proportions of mercuric chloride appears to be much less marked in some cases than in others. The author states that glycerine containing 1 part in 10,000 of this chemical is capable of sustaining *Penicillium glaucum*, while a proportion of 1 part in 6,000 or 1 part in 4,500 effectively prevents its growth.

Ptomaines of Infectious Diseases. A. B. Griffiths. (*Comptes Rendus*, cxiv. 496. From *Pharm. Journ.*) The author finds the ptomaine present in the urine of persons suffering from measles is glycocyamidine, $C_3H_5N_3O$. It is very poisonous. Administered to a cat, it produced fever with a high temperature and death in thirty-six hours. The ptomaine obtained from the urine of patients suffering from whooping-cough proves to have the composition $C_5H_{10}NO_2$, and it has also been obtained by direct cultivation of the bacillus which Afanassieff has identified as that of whooping-cough. Neither of these ptomaines occurs in normal urine.

Menthol as a Remedy for Hay Fever. L. Wainwright. (*Brit. Med. Journ.*, July 18th, 1891, 124.) The author strongly recommends the use of smelling-salts consisting of a mixture of menthol and carbonate of ammonia as an efficient remedy for the relief of hay fever. It appears to cause a rapid disappearance of irritability, and in many cases there is no return of the troublesome symptoms.

Hydrastis Canadensis as a Remedy in Phthisical Night-Sweats. (*Chemist and Druggist*, December 19th, 1891.) It has been observed that patients treated with hydrastis canadensis for blood-spitting had the night-sweats entirely arrested. The dose is 30 drops of fluid extract at bedtime.

Exodyne. F. Goldmann. (*Pharm. Zeit.*, 1892, No. 5.) The preparation introduced under this name is found by the author to consist of a mixture of about 90 per cent. of acetanilid, 5 per cent. of sodium salicylate, and 5 per cent. of sodium bicarbonate.

Ferrated Cod-Liver Oil. (*From German Unofficial Formulary.*)

Benzoate of Iron	1 part.
Cod Liver Oil	100 parts.

Triturate the iron salt with the cod-liver oil, and warm gently until the former is dissolved.

Iodized Cod-Liver Oil. (*From German Unofficial Formulary.*)

Iodine	1 part.
Cod-Liver Oil	1,000 parts.

Triturate the iodine with some of the cod-liver oil, and shake frequently until the iodine is dissolved.

Ferro-Iodized Cod-Liver Oil. (*American Druggist, May 1st, 1892.*)

Iron, in powder	2 parts.
Iodine	4 "
Cod-Liver Oil, enough to make	1,000 "

Triturate the iron and iodine in a mortar with 40 parts of cod-liver oil and a little ether until all the iodine has disappeared and a black mixture has resulted; mix this with enough cod-liver oil to produce 1,000 parts, and filter.

The product has a brownish-red colour, and contains 5 per cent. of ferrous iodide.

Emulsions of Cod-Liver Oil and Castor Oil. P. Van Aspern. (*Pharm. Journ.*, 3rd series, xxii. 332.) Instead of the usual method of preparation with acacia, the author recommends the use of a 20 per cent. solution of potash soap, by which means it is possible to prepare an emulsion containing 80 per cent. of oil; the emulsion is stated to be tasteless if taken in milk or warm coffee; if necessary, syrups, creasote, or flavouring substances may be added.

Castor Oil Emulsion.—2 parts of potash soap are dissolved in 10 parts of distilled water and mixed with 40 parts of castor oil. The mixture is flavoured by addition of 6 drops of oil of pepper-mint.

Administration of Cod-Liver Oil. (*Revue Thérapeutique*, 1891, 641.) A mixture of equal parts of cod-liver oil and lime water is recommended for exhibiting cod-liver oil in a form which is borne by a delicate stomach. The mixture is milky and inodorous; it does not develop a rancid and repugnant after-taste. The assimilation is said to take place readily.

Sweetened Castor Oil. M. Standke. (*Rundschau*, 1892, 111.) This preparation is obtained by thoroughly washing freshly expressed castor oil with hot water, and incorporating sufficient

saccharin to give it a sweet taste; it is then flavoured by adding small quantities of oil of cinnamon and extract of vanilla. The preparation is stated to keep very well, and to be agreeable in taste.

Paraldehyde Emulsion. T. J. Keenan. (From *Pharm. Record*.) The following formula is stated to make a good emulsion, mixing readily with water:—

Paraldehydi	3viii.
Ovi vitelli	No. vj.
Olei cassiæ	℥xxx.
Sacchari alb. pulv.	5j.
Aquæ ad.	3xvj.

M.

It is best prepared by rubbing up the sugar with the yolk of egg, and incorporating the paraldehyde and oil of cassia slowly and with constant stirring, after which the water is added in divided portions until the whole of it is taken up and a perfect emulsion formed.

Syrup of Balsam of Peru. (From *German Unofficial Formulary*.)

Balsam of Peru	1 part.
Sugar	a sufficient quantity.
Water	a sufficient quantity.

Upon the balsam of Peru pour 10 parts of hot water and set it aside, occasionally shaking, during twenty-four hours, at a temperature between 15° and 20° C.; then filter. In 8 parts of the filtered aqueous solution dissolve 12 parts of sugar.

Syrup of Bananas in Chronic Bronchitis. (*American Druggist*, April 15th, 1892.) For chronic bronchitis with scanty expectoration, the use of banana juice is recommended. The juice is prepared by cutting up the bananas in small pieces, and putting them, with plenty of sugar, in a closed glass jar. The latter is then placed in cold water, which is gradually made to boil. When the boiling point is reached, the process is complete. Of the syrup so made, a teaspoonful every hour is the proper dose.

Worm Syrup. (*Chemist and Druggist*, July 18th, 1891.)

Fluid Extract of Spigelia	5 ozs.
Fluid Extract of Senna	3 "
Oil of Anise	10 m.
Oil of Caraway	10 "
Syrup	8 ozs.

Mix.

Dose: one or more teaspoonfuls at intervals until purging commences.

Syrupus Roborans. J. Macintyre. (*Chemist and Druggist*, July 18th, 1891.) The author recommends the following formula:—

Quiniæ bimuriatis	gr. xxv.
Strychnæ sulphatis	gr. ½.
Aquæ destillatæ	5ij.
Syr. hypophosphit. c. ferro.	3vj.

M.

Elixir of Pepsin and Bismuth. G. M. Beringer. (From *Amer. Journ. Pharm.*)

Pure Pepsin	128 grains.
Citric Acid	120 „
Bismuth Ammonio-citrate	128 „
Strong White Wine	8 fluid ozs.
Spirit of Orange	2 fluid drachms.
Sugar	4 troy ozs.
Water of Ammonia } Water }	of each a sufficient quantity.

Dissolve the citric acid in 4 fluid ozs. of water, and rub up the pepsin with this solution; add the wine, and gently warm at a temperature of not over 100° F. until the pepsin is dissolved. Dissolve the ammonio-citrate of bismuth in 1 fluid oz. of water, with the aid of a few drops of ammonia-water, add this solution to the pepsin solution, and then gradually add ammonia-water until the solution becomes perfectly clear and neutral, or very slightly alkaline. Now add the sugar, spirit of orange, and sufficient water to make 16 ozs. Filter if necessary.

Elixir of Yerba Santa. T. H. Strouse. (*Amer. Journ. Pharm.*, January, 1892.)

Yerba Santa	3 ozs.
Sweet Orange Peel	1 oz.
Cardamom } Cloves }	. of each 1½ drachms.
Cinnamon }	
Anise } Coriander }	. of each 1 drachm.
Caraway }	
Red Saunders	½ drachm.
Sugar (granulated)	1½ lbs.
Alcohol } Glycerine }	. of each 6 fl. ozs.
Distilled Water	sufficient for 2½ pints.

Reduce the drugs to a No. 40 powder. Macerate for 24 hours,

and percolate with the mixture of alcohol, glycerine and water, until $2\frac{1}{2}$ pints have passed through. Filter this solution, and percolate it through the sugar.

Fig Wine. J. H. Vogel. (*Zeitschr. für angew. Chem.*, 1891, No. 21.) The author reports on the preparation and properties of fig wine. This wine has an agreeable, refreshing, acidulous taste, not differing from the light red wines from grapes, the odour and taste of figs being no longer recognisable. The colour, however, is somewhat paler than the grape wines alluded to. On distillation it yields a "brandy" of very pleasant odour and taste. The proportion of alcohol in the wine amounts to upwards of 4 per cent. The author agrees with P. Carles that the presence of mannite in this wine affords a good means of distinguishing it chemically from grape wine. In his opinion fig wine will have a future, in view of the rapid spread of phylloxera among the vineyards of the very countries in which the fig culture is furthest advanced.

A full description of the mode of preparing this wine will be found in the original paper.

Artificial Carlsbad Salts. (From *German Unofficial Formulary.*)

Sodium Sulphate (cryst.)	. . .	5 parts.
Sodium Carbonate (cryst.)	. . .	2 "
Sodium Chloride	. . .	1 part.
Hot Water	. . .	12 parts.

Dissolve the salts in the hot water, filter the solution, and evaporate it until a film begins to form on the surface, then set it aside to crystallize. Separate the crystals from the mother liquor, and transfer them (without washing them with water) to bottles. The mother liquor is to be rejected.

The resulting crystals are colourless, with a tendency to efflorescence, and are soluble in 2.5 parts of water.

Compound Cascara Pill. W. Murrell. (*Chemist and Druggist*, December 5th, 1891.) The following quantities are for 1 pill:—

Extracti Cascaræ Sagradæ	. . .	2 grains.
Aloin	. . .	$\frac{1}{2}$ grain.
Strychninæ	. . .	$\frac{1}{60}$ "
Extracti Belladonnæ	. . .	$\frac{1}{8}$ "
Ipecacuanhæ	. . .	$\frac{1}{16}$ "

One such pill is to be taken in the morning before breakfast, or three times a day after meals, according to the necessities of the patient.

Salol Pills. (*Chemist and Druggist*, December 26th, 1891.) As salol only splits up in the system when it reaches the intestines, Ceppi proposes that it should be made into pills which will not dissolve until they pass the stomach. It is therefore suggested that these pills should be coated with a solution of salol and tannin in ether, then with ethereal tincture of tolu. (See next abstract.)

Use of Salol for Coating Pills. P. Yvon. (*L'Union Pharm.*, October 1st, 1891, 436.) The application of salol for pill-coating was first suggested by Ceppi, as specially adapted to pills intended to produce no action until they reach the intestines. In order to attain this end, the author recommends such pills to be varnished several successive times with a solution of 2 grams of salol and $\frac{1}{2}$ gram of tannin in 10 grams of ether, until the protecting layer is sufficiently thick.

Creasote Pills. J. C. Roberts. (*Amer. Journ. Pharm.*, January, 1891.) The author recommends the following procedure:—Mix two parts of creasote with three parts of powdered liquorice root, and when absorption has taken place, add one part of powdered soap, and make up with syrup.

Creasote Pills. M. Gerber. (*Schwz. Wochenschr. fur Chem. und Pharm.*, 1892, 73.) Creasote pills containing a large proportion of creasote may be made by a modification of Dieterich's method, as follows:—

Creasote	. . . . .	10 parts.
Glycerine	. . . . .	1 part.
Extract of Liquorice	. . . . .	10 parts.
Powdered Liquorice Root	. . . . .	19 „

Dinner Pills. (*Chemist and Druggist*, March 19th, 1892.) Dr. Nevins recommends the following:—

Purified Ox-bile	. . . . .	2 grains.
Extract of Barbadoes Aloes	. . . . .	1 grain.
Rhubarb, in powder	. . . . .	1 „
Extract of Nux Vomica.	. . . . .	$\frac{1}{2}$ „
Mix for 1 pill.		

Dose: 1 pill to be taken daily for a few days before a mid-day meal.

As another good “stomachic and laxative dinner pill,” Dr. Lacey suggests:—

Pepsin	1 grain.
Extract of Rhubarb	$\frac{1}{2}$ "
Extract of Socotrine Aloes	$\frac{1}{2}$ "
Powdered Capsicum	$\frac{1}{2}$ "
Canella-bark, in powder	1 "
Extract of Gentian	1 "

Mix for 1 pill.

The next formula is given by Dr. J. Davies for "chronic or habitual constipation in elderly people":—

Extract of Socotrine Aloes	2 grains.
Extract of Hyoscyamus	$\frac{1}{2}$ grain.
Ginger, in powder	$\frac{1}{2}$ "
Extract of Dandelion	$\frac{1}{2}$ "
Extract of Nux Vomica	$\frac{1}{2}$ "

Mix for 1 pill.

Dose: 1 before dinner daily.

Chocolate Cocaine Tablets. (*Chemist and Druggist*, February 27th, 1892.)

Hydrochlorate of Cocaine	3 grains.
Powdered Tragacanth	36 "
" Chocolate	108 "
Essence of Vanilla	20 drops.
Water	50 "

Make a mass, and divide into 48 tablets.

Iron Tonic Bitters. (*Chemist and Druggist*, July 18th, 1891.)

Gentian	2 ozs.
Bitter Orange	1 oz.
Calamus	1 "
Tincture of Citro-chloride of Iron	1 "
Rectified Spirit	4 ozs.
Water	8 "
Dextrin Syrup	4 "

Exhaust the vegetable drugs with the spirit and water previously mixed, adding sufficient of a menstruum of the same alcoholic strength, until 12 fluid ounces are obtained. To this tincture add the iron, and lastly mix with the dextrin syrup.

Migraine Pastilles. (*Chemist and Druggist*, December 19th, 1891.)

Caffeine	$1\frac{1}{2}$ grains.
Phenacetin	$1\frac{1}{2}$ "
Milk Sugar	5 "

Mix well, and make into a pastille.

Snuff for Acute Coryza. M. Tissier. (*American Druggist*, January 1st, 1892.) The author recommends the use of the following snuff for the relief of a cold in the head:—

R. Menthol	gr. vi.
Powdered Boracic Acid	ʒij.
Subnitrate of Bismuth,	
Powdered Benzoin	āā ʒiij.

A good-sized pinch of this may be used five or six times a day. If desired, 1 grain of morphine and half a drachm of calomel may be added to the mixture, the addition apparently increasing its efficacy in certain cases.

Inhalation for Whooping-Cough. (*Chemist and Druggist*, January 30th, 1892.) Beall recommends, as an inhalation for the treatment of whooping-cough, the following mixture:—

Thymol	18 grains.
Carbolic Acid	3½ drachms.
Oil of Sassafras	2 „
Oil of Eucalyptus	2 „
Oil of Turpentine	2 „
Oil of Tar	2 „
Ether	1 drachm.
Rectified Spirit to	3 ozs.
Mix.	

About 30 drops of this mixture are placed on a handkerchief, and the child made to inhale it. This application is to be repeated every two or three hours.

Bronchitis Mixtures. J. Davies, W. T. Caldwell, and R. Wood. (*Chemist and Druggist*, February 13th, 1892.)

1. Carbonate of Ammonium	16 grains.
Syrup of Tolu	½ fluid oz.
Tincture of Squill	40 minims.
Compound Tincture of Cinchona	2 fluid drachms.
Spirit of Chloroform	4 minims.
Rose-water	2 fluid ozs.
Mix.	

Dose: 1 fluid drachm every four hours.

2. Sulphate of Quinine	1 grain.
Extract of Hemlock	3 to 5 grains.
Dilute Hydrobromic Acid	4 minims.
Water to	1 fluid oz.
Mix.	

Dose: 1 fluid oz. every four hours.

3. Tartrated Antimony	$\frac{1}{2}$ grain.
Spirit of Chloroform	12 minims.
Tincture of Opium	7 „
Burnt Sugar	3 grains.
Water to	1 fluid oz.
Mix.	

Dose: 1 fluid oz. three times a day.

Mixture for Asthma. M. Huchard. (*Rev. gén. de Clin. et de Thérap.*, 1891, No. 26.) The author recommends the following:—

Iodide of Potassium	} . . . of each	10 grams.
Tincture of Lobelia		
Tincture of Senega		
Extract of Opium		0·1 gram.
Distilled Water		900 grams.

Dose: 1 teaspoonful morning and night in a small wineglassful of water.

Glycerine Suppositories with Boric Acid. P. Boa. (From *Chemist and Druggist*.) The use of boric acid as a laxative, when introduced into the rectum, having recently been advocated, the author thought of employing the Glycerinum Boracis of the British Pharmacopœia. For the purpose of comparison he made two sets of 15-grain suppositories, one with glycerine alone, and the other with glycerine of borax. They were tried practically, and the results were distinctly in favour of those containing boric acid. The simple glycerine suppositories either failed to act at all or acted only very slightly, while those containing boric acid acted in some cases as efficiently as large glycerine suppositories, requiring, however, a longer time.

Camphoid: a new Substitute for Collodion for Medical Use. W. Martindale. (*Pharm. Journ.*, 3rd series, xxii. 831.) The author avails himself of the solubility of iodoform in 10 times its weight of Rubini's solution of camphor, composed of equal parts by weight of camphor and dilute alcohol, and dissolves 1 part of pyroxylin in 40 parts of such a solution. Applied to the skin, this preparation dries in a few minutes and forms an elastic opaque film, which does not wash off. The excess of camphor seems to volatilize, and as it disguises the odour of the iodoform its solution forms a useful vehicle for applying this drug. Pyroxylin dissolves readily in the simple solution of camphor, and this forms a cleanly basis for the application of many medicaments to the skin, such as carbolic acid, salicylic acid, resorcin, iodine, chrysarobin, and ichthyol.

The author suggests the name "camphoid" for the simple pyroxylin solution.

Compound Liniment of Capsicum. (From the Supplement to the 3rd edition of the *Netherlands Pharmacopœia*.) This preparation is used as a counter irritant to relieve pain. It is made as follows:—

Tincture of Capsicum	523 parts.
Camphor	30 "
Oil of Rosemary	10 "
„ Lavender	10 "
„ Thyme	10 "
„ Cloves	10 "
„ Cinnamon	2 "
Water of Ammonia	300 "
Olive-Oil Soap	3 "
Burnt Sugar	5 "
Water	97 "

Dissolve the camphor and oils in the tincture, and mix this with the water of ammonia. Then dissolve the soap and sugar in the water, and mix the whole together.

The tincture of capsicum is directed to be prepared by macerating powdered capsicum, during eight days, with three times its weight of alcohol of specific gravity 0.834, and filtering.

Linimenta Exsiccantia. P. J. Pick. (*Pharm. Post.*, 1891, 425; *Amer. Journ. Pharm.*, August, 1891.) *Linimenta exsiccantia* or drying liniments are intended as an improvement on the gelatin treatment in dermal practice. The base is made by either triturating in a mortar or heating in a suitable vessel 5 parts of tragacanth, 2 parts of glycerine, and 100 parts of water. Made by the aid of heat, the preparation keeps without the addition of antiseptics. The advantages of this base are that it can be applied in very thin layers, and can be removed by simply washing with water. To medicate the base, soluble substances are dissolved in the water used in its preparation; insoluble substances, oils, iodoform, zinc oxide, etc., are triturated with the base in a mortar.

Creolin-Iodoform Ointment. (*Nouveaux Remèdes*, September 24th, 1891.)

Creolin	15 grains.
Iodoform	30 "
Vaseline	6 drachms.

The odour of iodoform is stated to be well masked in this preparation.

Camphorated Paraffin. K. Rosner. (*Zeitschr. für Therapie*, September 1st, 1891.) The author recommends a solution of camphor in liquid paraffin, which, when slightly warmed, forms a perfectly clear and limpid solution. He states that he has kept this solution for more than five years without its properties becoming changed.

Unna's Medicated Skin Varnishes. (*Pharm. Journ.*, from *Therapeut. Monatschr.*) Skin varnish is the term applied by Unna to preparations used in dermatological practice for forming a thin covering on the skin. The principal bases for these preparations are the following :—

Bassorin Varnish.—The pure bassorin basis is obtained, according to Elliot, by filtering tragacanth mucilage (15 : 100) in a filter heated by steam, evaporating, and mixing with glycerine. A similar basis may be prepared by stirring 5 parts of powdered salep with 95 parts of cold water until a smooth mucilage is obtained, then heating for half an hour on the steam-bath. The salep basis contains less bassorin but more starch.

Casein Varnish.—The casein obtained by coagulating skim-milk with rennet at a temperature of 35° to 40° is washed and dried until it forms a yellowish-white sandy powder soluble in alkaline solutions. In preparing the casein varnish, this casein is dissolved by means of borax. For 20 parts of casein 2·5 parts of borax and 77·5 parts of water furnish a rapidly drying uniform covering material. The alkaline characters of the borax are marked by the casein. Admixtures of heavy pulverulent substances readily settle out of this basis, and it is requisite to distribute them by shaking. A varnish of casein and glycerine is prepared by dissolving the casein in 3 or 3·5 parts of ammonia, adding a quantity of glycerine equal in weight to the casein, and heating to drive off the ammonia. The resulting mass mixed with twice its weight of boiling water gives an excellent permanent emulsion.

Amber Varnish is made by dissolving a mixture of amber and turpentine in alcohol. It must not be used as a vehicle for the application of zinc oxide.

Castor Oil and Shellac Varnish.—With 1 part of shellac, $\frac{1}{5}$ part of castor oil, and 3 parts of alcohol, a varnish is obtained which forms a good flexible covering easily removed by alcohol.

Canada Balsam and Collodion Varnish.—16 parts of collodion with 1 part of Canada balsam gives a material suitable for the application of pyrogallol, and it can be easily removed by alcohol.

Castor Oil and Collodion Varnish.—8 parts of collodion and 1 part of castor oil.

Lead Ricinoleate Varnish.—1 part of lead oxide heated with 1·5 parts of castor oil to saponification, and mixed with 2 parts of absolute alcohol, gives a good skin varnish.

Chrysarobin Amber Varnish.—1 part of chrysarobin and 20 parts of amber dissolved in turpentine.

Pyrogallol Shellac Varnish.—1 part of pyrogallol, 1 part of castor oil, 5 parts of shellac, and 15 parts of absolute alcohol.

Salicylic Acid, Canada Balsam, and Collodion Varnish.—1 part of Canada balsam, 10 parts of collodion, and 3 parts of salicylic acid.

Zinc Oxide, Castor Oil, and Collodion Varnish.—2 parts of zinc oxide, 2 parts of castor oil, and 16 parts of collodion.

Zinc and Lead Ricinoleate Varnish.—5 parts of lead ricinoleate, 8 parts of zinc oxide, 8 parts of absolute alcohol, and 1 part each of collodion and ether.

Ichthyol Borax Casein Varnish.—5 parts of sodium ichthyolate and 15 parts of borax casein varnish.

Sulphur Glycerine Casein Varnish.—5 parts of sulphur and 15 parts of glycerine and casein varnish.

Zinc Oxide Salepbassorin Varnish.—2 parts of zinc oxide and 18 parts of salepbassorin varnish.

Zinc Ichthyol Tragacanth Bassorin Varnish.—1 part of sodium ichthyolate, 2 parts of zinc oxide, and 16 parts of tragacanth bassorin varnish.

Application for Ringworm. (*Chemist and Druggist*, August 29th, 1891.) The following is recommended as an efficient remedy :—

Hydrarg. bichloridi	. . . . .	gr. ij.
Tinct. benzoine co.	. . . . .	3j.
M.		

Paint over affected parts.

Care should be exercised not to paint too large a surface, as the above mixture is toxic. If an excoriation exists it should not be applied, as it is irritating to the wounded integument.

Lotions for Baldness. T. Robinson. (*Chemist and Druggist*, August 29th, 1891.) The author recommends the following washes. The alkaline lotion is to be used for a week, and afterwards the acid one. The rubbing must be done with a piece of flannel or sponge :—

Alkaline.

Borax	1 drachm.
Glycerine	2 drachms.
Tincture of Cantharides	6 "
Solution of Ammonia	1 oz.
Essential Oil of Bay	4 drops.
Water	to 6 ozs.

M.

Acid.

Aromatic Vinegar	2 drachms.
Glycerine	2 "
Rectified Spirits	1 oz.
Blistering Liquid, B.P.	1 drachm.
Orange-flower Water	2 ozs.
Rose-water	to 6 "

M.

Lotion for Sore Nipples. (From *Nouveaux Remèdes*.)

℞ Balsam of Peru,	
Tincture of Arnica	āā ʒi.
Lime Water	ʒi.
Oil of Sweet Almonds	ʒiij.

Lotion for Baldness. (*American Druggist*, April 15th, 1892.)

One of the best combinations in the treatment of baldness consists of :—

℞ Pilocarpinæ Hydrochloratis	gr. v.
Olei Rosæ	ʒ viij.
Olei Rosmarini	fl. ʒiv.
Linimenti Cantharidis	fl. ʒiv.
Glycerini puri	fl. ʒi.
Olei Amygdalæ Dulcis	fl. ʒij.
Spiritus Camphoræ	fl. ʒiij.

M.S.—To be rubbed well into the scalp, night and morning.

Pomade for Dandruff. (*American Druggist*, April 15th, 1892.)

℞ Acidi Salicylici	ʒss.
Sodii Boratis	gr. xv.
Balsami Peruviani	ʒ xxiv.
Olei Anisi	ʒ v.
Olei Bergamot	ʒ xv.
Vaselini	ʒiij.

M. et ft. unguentum.

Corn Salve. C. W. Moister. (From *New Idea*.)

Yellow Wax	6 ozs.
Venice Turpentine	$\frac{3}{4}$ oz.
Pure Resin	$\frac{1}{2}$ "
Salicylic Acid	$\frac{1}{2}$ "
Balsam of Peru	$\frac{1}{2}$ "
Vaseline	1 "

Melt over a water-bath. Stir until cool.

Application for Warts. (*Pharm. Zeitung*.)

Salicylic Acid	1 part.
Lactic Acid	1 "
Collodion	8 parts.

All by weight. Mix.

This preparation is to be applied twice a day.

Lanolin Ointment for the Relief of Itching. R. Klein. (*Chemist and Druggist*, May 28th, 1892.) In order to relieve the itching in measles, scarlet-fever, and chicken-pox, the author employs a lanolin ointment containing a large amount of water, and of the following composition:—

Lanolin. anhydr. (Liebreich)	3j.
Vaselin	5iij.
Aq. destill.	5v.

Misce fiat unguentum.

Tannin Dentifrice. (*Chemist and Druggist*, June 4th, 1892.) The following is a French recipe for a preparation which is useful as a tooth-powder when the gums are spongy:—

Sugar of Milk	32 ozs.
Carmines	150 grains.
Pure Tannin	$\frac{1}{4}$ oz.
Oil of Peppermint	20 drops.
Oil of Anise	20 "
Oil of Orange-flowers	10 "

Triturate the carmine with the tannin, add the sugar of milk gradually, and finally the oils.

Antiseptic Tooth Powder. (*Chemist and Druggist*, April 23rd, 1892.)

Resorcin	30 grains.
Salol	60 "
Powdered Orris	1 ounce.
Precipitated Chalk	2 drachms.
Carmines	3 grains.
Oil of Peppermint	10 drops.

Mix.

Thymol Tooth Powder. (*Chemist and Druggist*, April 23rd, 1892.)

Thymol	30 grains.
Camphor	60 "

Rub together until melted, then add—

Precipitated Chalk	30 ozs.
Powdered Soap	10 drachms.
Saccharin	15 grains.
Vanillin	7½ "
Otto of Rose	a sufficiency.

Mix well and sift.

Preservative Tooth Powder. (*Chemist and Druggist*, February 27th, 1892.)

Precipitated Chalk	750 grains.
Carbonate of Magnesia	28 "
Borax	30 "
Powdered Almond Soap	250 "
" Orris	76 "
Thymol	1 grain.
Camphor	5 grains.
Oil of Peppermint	50 drops.
" Cloves	25 "
" Lemon	25 "
" Eucalyptus	25 "
Creosote or Carbolic Acid	10 "

Mix the powders thoroughly. Dissolve the thymol and camphor in sufficient spirit, and add to the powders, then add the rest of the ingredients, and mix well together.

Citroleine Dentifrice. (*Chemist and Druggist*, February 27th, 1892.)

Precipitated Chalk	1 lb.
Powdered Sugar	2 ozs.
" Orris	4 "
Cuttlefish Bone	2 "
Bicarbonate of Soda	2 "
Oil of Lemon	2 drs.

First tint the precipitated chalk with a concentrated tincture of saffron, and then spread on paper to dry. Then take the soft portion of the fish-bone, which can be scraped off with a knife, place in a mortar with the sugar, and rub well down to a fine powder. To this gradually add the powdered orris-root, bicarbonate of soda, and oil of lemon. Mix thoroughly, then gradually incorporate with the chalk by working in a mortar or mixer and sifter.

Tooth Wash. (*Chemist and Druggist*, February 27th, 1892.)

Soap Shavings (White Castile)	320 grains.
Oil of Peppermint	12 drops.
„ Lemon	12 „
„ Cassia	8 „
„ Cloves	8 „
„ Anise	16 „
Oil of Wintergreen	24 „
Jockey Club	24 „
Carmine, No. 40	$\frac{1}{2}$ gram.
Ammonia Solution	4 drops.
S.V.R.	8 ozs.
Water	8 „

Macerate the soap in the water until soft, dissolve the oils and extracts in the S.V.R., and having rubbed the carmine with the ammonia, mix the three solutions. Allow to stand for twenty-four hours and filter.

Antiseptic Liquid Dentifrice. (*Chemist and Druggist*, February 27th, 1892.)

Thymol	2 grains.
Carbolic Acid	5 drops.
Oil of Sassafras	8 „
„ Wintergreen	8 „
„ Rose Geranium	8 „
„ Eucalyptus	3 „
„ Calamus	5 „
„ Pumilio Pine	20 „
Glycerine	2 ozs.
S V.R.	4 $\frac{1}{2}$ „
White Castile Soap	2 drs.
Distilled Water to	16 ozs.
Calcium Phosphate	a sufficiency.
Colour	„
Caramel	„
Tincture of Cudbear	„

Dissolve the soap in 5 ozs. of warm water. Dissolve the acid, thymol, and oils in the spirit and add to the soap solution. Filter through paper containing a small quantity of calcium phosphate. Add the glycerine.

Cement for Teeth. W. H. Rollins. (*Chemist and Druggist*, August 29th, 1891.) For pulp-capping and temporary filling, the author recommends the following mixture:—

Basic Oxide of Zinc	2 parts.
Oxide of Magnesium	5 „

For use, mix to a paste with syrupy phosphoric acid.

Brown Hair Dye. (*Pharm. Centralhalle.*) A recent analysis of a well-known Berlin hair dye shows the following composition:—

Pyrogallic Acid	4 parts.
Chloride of Copper	2·4 „
Water	100 „

Ammonium Anacardate as a Hair Dye. A. Gawalowski. (*Zeitschr. des österr. Apoth. Vereins*, September 10th, 1891, 485; *Pharm. Journ.*, 3rd series, xxii. 265.) Anacardic acid, $C_{22}H_{32}O_{31}$, is known to be a constituent of the pericarp of the cashew nut (*Anacardium occidentale*), in which it is associated with a very acrid substance known as cardol. In order to obtain a preparation free from the latter, the author recommends that the residue from the evaporation of an ethereal extract of the crushed pericarp should be freed from tannin by repeated washing with water, then dissolved in 15 to 20 parts of alcohol, the solution shaken with freshly precipitated lead hydrate, and the lead precipitate then washed with alcohol and decomposed with freshly prepared solution of ammonium sulphide. Upon strongly cooling the filtrate, which contains the ammonium salt of anacardic acid and excess of ammonium sulphide, and treating it with sulphuric acid, the acid separates at once as a soft mass, which after being pressed between filter paper is dissolved in ammonia and then remains soluble in water.

For the purpose of using such a preparation as a hair dye, the hair is first moistened with an aqueous solution of the salt and afterwards combed with a comb that has been dipped in a solution of ferrous sulphate, or the ammonium anacardate may be applied in a pomade or oil, and instead of the solution of ferrous sulphate an oleate of iron may be employed. After a short exposure to the air, the hair so treated assumes a more or less dark and fairly persistent colour.

Tonic Hair Wash. (*Chemist and Druggist*, July 18th, 1891.)

Borax	1 drachm.
Salicylic Acid	20 grains.
Tincture of Cantharides	$\frac{1}{2}$ oz.
Bay Rum	2½ ozs.
Rose-water	2½ „
Water	5 „

Dissolve the borax and the acid in the water by the aid of heat; after it is cold add the bay rum, cantharides, and rose-water.

This should be used with a soft sponge once a day, rubbed gently into the roots of the hair.

Vaseline Cosmetic. (*Chemist and Druggist*, January 23rd, 1892.)

Ceresin	1 oz.
Vaseline	2 „
Mutton Suet	1 „
Lard	$\frac{1}{2}$ „

Melt the substances in the order given, strain if necessary, and after perfuming, pour into suitable moulds.

For white cosmetic white vaseline should be used, but for other colours the yellow. Burnt umber is used for the brown cosmetic, and drop-black for black. A good perfume for the cosmetic is composed of the following:—

Oil of Bergamot	5ijss.
„ Petit Grain	5ijss.
„ Lavender	5j.
„ Cloves	5j.

Mix.

Hair-Oil Perfumes. (*Chemist and Druggist*, February 27th, 1892.) The following quantities of perfume suffice for one gallon of the best olive oil:—

Rose.

Oil of Bergamot.	7 drachms.
Otto of Roses	50 minims.
Oil of Rose-geranium	30 „
„ Cloves	80 „

Violet.

Oil of Bergamot.	4 drachms.
„ Santal	80 minims.
„ Orris	80 „
„ Cloves	30 „
Otto of Rose	16 „

Orange.

Oil of Bergamot.	6 drachms.
„ Bitter Orange	3 „
„ Orange-flowers	30 minims.
„ Rose-geranium	80 „
„ Petit Grain	50 „

Heliotrope.

Oil of Rose-geranium	3 drachms.
„ Cloves	50 minims.
Peruvian Balsam	50 „
Heliotropin (dissolved in a little warm olive oil)	15 grains.

Reseda.

Oil of Bergamot	10 drachms.
" Rose-geranium	3 "
" Cloves	80 minims.
" Basilica	90 "

Brilliantine. (*Chemist and Druggist*, July 18th, 1891, January 23rd, 1892.)

1. Oil of Sweet Almonds 8 ozs.
 Rectified Spirit 4 "
 Glycerine 1 oz.
 Oil of Rose-geranium 12 drops.
2. Castor Oil 6 parts.
 Venetian Soap 2 "
 Benzoin 2 "
 Rectified Spirit 200 "
 Otto of Rose or Oil of Neroli . . . a sufficiency.
3. Glycerine 10 parts.
 Spirit 100 "
 Rose Water 100 "
4. Castor Oil 6 "
 Glycerine 6 "
 Benzoin 2 "
 Spirit 200 "
 Perfume a sufficiency.

Essence of Hyacinth. (*Chemist and Druggist*, January 9th, 1891.)

Hyacinthin	60 parts.
Oil of Neroli (Bigarade)	10 "
Tincture of Musk	50 "
Tincture of Benzoin	100 "
Extract of Jasmin (triple)	500 "
Alcohol (deodorised)	3,000 "
Orange-flower Water (triple)	300 "

Artificial Essence of Clove-Pink. (*Chemist and Druggist*, June 4th, 1892.)

Extract of Rose	14 ozs.
" Orange-flowers	7 "
Essence of Vanilla	3½ "
Oil of Cloves	160 drops.

Mix, and, after standing for several days, filter.

Elder-Flower Perfume. (*Chemist and Druggist*, January 23rd, 1892.)

Tuple Extract of Jasmine . . .	200 parts.
" " Rose . . .	200 "
" " Tuberose . . .	200 "
" " Jonquil . . .	200 "
" " Orange . . .	200 "
Oil of Ylang-ylang . . .	0.1 "
Tincture of Musk . . .	2.5 "
" Ambergis . . .	2.5 "
Terpineol, 5 parts dissolved in	
Rectified Spirit . . .	60 "
Mix.	

The terpineol is required to give the perfume the characteristic odour of the flower.

Ink for Writing on Glass and Porcelain. (*Rundschau*, 1891, 970.) 10 parts of bleached shellac and 5 parts of Venetian turpentine are dissolved in 15 parts of oil of turpentine by immersing the containing vessel in warm water; after solution is effected, 5 parts of lamp-black are incorporated.

Gold Marking Ink. (*Prager Rundschau; Chemist and Druggist*, February 27th, 1892.)

A Solution :—

Chloride of Gold and Sodium . . .	1 part
Gum Arabic . . .	2 parts.
Water . . .	10 "

B Solution :—

Oxalic Acid . . .	1 part.
Gum Arabic . . .	5 parts.
Water . . .	5 "

The linen is first to be treated with the B solution, and after it has dried it is written upon with A solution. It is afterwards polished under strong pressure, and may then be marked.

Gold Size. (*Chemist and Druggist*, February 27th, 1892.) Heat 3 parts of the best linseed oil almost to the boiling-point, then add gradually, and with constant stirring, 1 part of animi resin, which has previously been warmed and reduced to coarse powder. Continue to heat the mixture until the animi is dissolved (each portion should really be dissolved before adding another) and it acquires a tarry consistence. Then allow to cool, and thin with turpentine.

Silver Soap. (*Chemist and Druggist*, October 3rd, 1891.)

Cocoa-nut Oil	10 ozs.
Soda-lye, 20°	20 (by weight).

Boil these until saponification is complete, or take

White Soap	5 ozs.
Water	5 „

making a solution, with which intimately mix

Prepared Chalk	15 ozs.
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If a red soap is desired use the following, instead of 15 ozs. of prepared chalk :—

Prepared Chalk	8 ozs.
Red Tripoli	2 „
White Tripoli	3 „
Polishing Rouge	3 „

Arabol-Gum. F. M. Horn. (*Pharm. Post.*, 1892, 525; *Amer. Journ. Pharm.*, June, 1892.) Arabol-gum is an artificial product containing 15·12 per cent. of water, 0·81 per cent. of ash, 24·23 of maltose, 54·48 of dextrin, 4·18 of starch. The following method gives a similar product :—100 grams of wheat starch are heated with 500 c.c. of water containing 10 grams of oxalic acid in a water-bath at 90° C. for four hours, stirring occasionally; after neutralizing with powdered marble and filtering, the transparent yellow filtrate is evaporated and dried in a water-bath until the mass retains only 14 per cent. of moisture.

Cements. (*Pharm. Zeitung*, 1892, 154; *Pharm. Centralhalle*, 1892, 330; *Amer. Journ. Pharm.*, 1892, 409.)

Diamond Cement.—500 parts of finest glue are allowed to soften and swell for several hours in 400 parts of water and 100 parts of acetic acid (96 per cent.); it is then warmed until dissolved and 1 part of pure carbolic acid added.

Universal Cement.—250 parts of sugar placed in a flask are dissolved in 750 parts of water by the aid of a water-bath, 65 parts of slaked lime are added, and the mixture is warmed for 3 days at 70–75° C., agitating repeatedly. After cooling, the clear supernatant liquid is decanted; 200 parts are diluted with 200 parts of water, and 550 parts of finest glue allowed to swell in it for three hours, when heat is applied until perfect solution takes place. After restoring the original weight by adding water, the addition of 50 parts of acetic acid (96 per cent.) and 1 part of pure carbolic acid finishes the preparation.

Syndelikon.—In 400 parts of the sugar-lime solution (see above) 600 parts of ground glue are allowed to soften for three hours ; after heating to effect solution and replacing the evaporated water, the cement is neutralized with oxalic acid (about 30 parts) and 1 part of carbolic acid is added.

Cement for Porcelain.—20 parts of white lead and 12 parts of pipe-clay, carefully dried, are incorporated with 10 parts of boiled linseed oil heated on a water-bath. The cemented articles are dried slowly in a warm place.

Superior Polishing Paste for Metals. (*Zeitschr. des österr. Apoth.-Ver.*, 1892, 360.) 6 parts of chalk, 3 of white lead, 3 of cream of tartar, and 3 of magnesia, all in the form of very fine powders, are mixed together and intimately incorporated with 48 parts of soap previously moistened with water and liquefied by heat. The hot mixture is poured into moulds and allowed to cool. It is then cut into small cubes.

Lily of the Valley Perfume. H. Soxhlet. (*Zeitschr. des österr. Apoth.-Ver.*, 1892, 360.) The following mixture is stated to possess in a remarkable degree the characteristic odour of *Convallaria majalis*.—

Extract of Jasmin	200 parts.
Extract of Ylang-Ylang	100 „
Alcohol (95 per cent.)	200 „
Powdered Cardamoms	5 „

Macerate for 2 days and then filter.

Quinine Pomade. (*Chemist and Druggist*, from *Oest. Zeit. für Pharm.*)

Sulphate of Quinine	gr. xv.
Citric Acid	gr. xxiv.
Eau de Cologne	5j.

Dissolve and add—

Simple Ointment	5iij.
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Mix and add the following solution—

Tannic Acid	3ss.
Orange-flower Water	5ias.
Otto of Rose	gtt. v.
Oil of Neroli	gtt. v.
Essential Oil of Almonds	gtt. ij.

Beard-Colouring. (From *Chemist and Druggist*.) *Der Seifen-fabrikant* recommends this to be made by melting 20 parts of soft

soap on a water-bath, and adding to it 1 part of gum arabic dissolved in 2 parts of water. The colouring for brown is fine mahogany-brown with a little drop-black, and the latter alone for black. The colouring must be finely comminuted, and well mixed with the basis. The preparation may be perfumed with a sufficiency of the following mixture after it cools :—

French Geranium Oil	. . . . .	20 parts.
Oil of Bergamot	. . . . .	10 „
Oil of Cloves	. . . . .	15 „
Cedar-wood Oil	. . . . .	2 „

Form the colouring into sticks about 3 in. long, and $\frac{3}{4}$ in. in diameter.

Sulphur-Phosphorus Paste. H. Heine. (From *Pharm. Record.*)

Phosphorus	. . . . .	22 parts.
Sublimed Sulphur	. . . . .	5 „
Water	. . . . .	enough to cover.

Pour upon these as much bisulphide of carbon as will dissolve the sulphur and phosphorus, then add—

Powdered Mustard	8 parts.
Water	300 „
Powdered Sugar	240 „
Wheat Meal	300 „

Mix.

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TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
TWENTY-NINTH ANNUAL MEETING
AT
EDINBURGH,
1892.

C O N T E N T S.

CONSTITUTION AND RULES OF THE CONFERENCE.

ALPHABETICAL LIST OF MEMBERS' NAMES AND ADDRESSES.

PROGRAMME OF TRANSACTIONS OF THE CONFERENCE AT EDINBURGH, 1892,
INCLUDING TITLES OF PAPERS.

THE TRANSACTIONS OF THE CONFERENCE, INCLUDING THE PAPERS READ,
AND DISCUSSIONS THEREON.

GENERAL INDEX TO THE YEAR-BOOK AND TRANSACTIONS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

* * * Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

(Name)

(Address)

as a Member of the British Pharmaceutical Conference.

Member.

Date

This or any similar form must be filled up legibly, and forwarded to The Asst. Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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- BRISTOL.**—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.
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- OLDHAM.**—Chemists' and Druggists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute, Oldham.
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 HARDY, R., Edinburgh.
 HENDRY, R. L., Edinburgh.
 HENRY, CLAUDE F. (Asst. Secretary), Edinburgh.
 HERON, JAS., Edinburgh.
 HETHERINGTON, T., Moffat.
 HILL, J. RUTHERFORD, Edinburgh.
 HINDS, JAS., Falkirk.
 HOUSAM, C., Dundee.
 HUNTER, ANDW., Edinburgh.
 HUTCHISON, W., Bonnyrigg.
 JOHNSON, F. F., Dumfries.
 JONES, S., Edinburgh.
 KENNEDY, A., Edinburgh.
 KEIR, R. M., Edinburgh.
 KEV, G. B., Kirkcaldy.
 KING, WM., Edinburgh.
 LAING, A. C., Juniper Green.
 LAIRD, G. H., Edinburgh.
 LAWRIE, J. M., Edinburgh.
 LEASK, J., Edinburgh.
 LEITCH, P., Greenwau.
 LINDMAN, J., Biggar.
 LINDSAY, R., Peebles.
 LISTER, DAVID, Ratho.
 LOCKERIE, J., Edinburgh.
 LOCHAS, J., Edinburgh.
 LUMDEN, THOMAS, Luddington.
 LUNAN, G., Edinburgh.
 LYON, T., Falkirk.
 MAHER, T., Hawick.
 MACADAM, S. Ph. D., Edinburgh.
 MACADAM, W. I., Edinburgh.
 MACATEL, D., Gorebridge.
 MACDONALD, D. F., Edinburgh.
 MACDONALD, J., Edinburgh.
 MACDONALD, J. A., Dumfries.
 MACGILLIVRAY, F., Portobello.
 MACKEY, G. D., Edinburgh.
 MACKEY, W. B., Edinburgh.
 MACKENZIE, JAMES, Edinburgh.
 MACMAY, PROFESSOR SIR DOUGLAS, M.D., Edinburgh.
 MACLEAN, C. D., Edinburgh.
 MACPHERSON, C. A., Edinburgh.
 MACLEOD, J., Edinburgh.
 MCINTYRE, J., North Berwick.
 MC CALL, W. G., Edinburgh.
 MC CALLUM, A. I., Edinburgh.
 MC DONNELL, REA, I., Leith.
 MC LARRAN, D., Edinburgh.
 MCHIBSON, G. L., Edinburgh.
 MC LAEN, D., Edinburgh.
 MC LAREN, DUNCAN, Edinburgh.
 MC NAIR, R. H., Edinburgh.
 MC NEE, ALEX., Edinburgh.
 MARSON, W. M., Edinburgh.
 MARRIE, J., Kelso.
 MATHIESON, R., Innerleithen.
 MAXTON, W. M., Kelso.
 MIDDLETON, D., Edinburgh.
 MILLER, T., Portobello.
 MYCHELL, W. K., Edinburgh.
 MOORE, F. P., Dumfries.
 MOWSON, G., Peebles.
 MORROW, J., Edinburgh.
 MURCHIE, W., Lockertie.

MURDOCH, D., Falkirk.
 MATH, A., Leith.
 NELSON, J. J., Edinburgh.
 NESSIT, J., Portobello.
 NICOL, J. K., Edinburgh.
 NISBET, A., Edinburgh.
 PATER, JAS., Edinburgh.
 PEEBLES, J., Kirkcaldy.
 POTTAGE, J. C., Edinburgh.
 POUSTIE, J. H., Galashiels.
 PRESTON, J., Edinburgh.
 PINKERTON, W., Edinburgh.
 PIERCE, S., Edinburgh.
 RAE, FRANK, South Queensferry.
 RICHARDSON, W., Edinburgh.
 RICHARDSON, W. J., Edinburgh.
 RITCHIE, J., Edinburgh.
 ROBERTSON, G., Edinburgh.
 ROBERTSON, JAS., Edinburgh.
 ROBERTSON, J., Edinburgh.
 ROSE, W., Galashiels.
 SANDERSON, W. J., Peebles.
 SCOTCH, J., Edinburgh.
 SCOTT, JAS., Edinburgh.
 SELBY, T. J., Edinburgh.
 SHARP, J., Musselburgh.
 SKINNER, W., Leith.
 SMITH, J., Edinburgh.
 SMITH, A. L., Edinburgh.
 SMITH, W., Edinburgh.
 SMITH, T. F. R. S., Edinburgh.
 SPENCE, DR., Luddington.
 SPENCE, T. B., Edinburgh.
 SPENCE, W., Edinburgh.
 STEPHEN, J., Leith.
 STEPHENSON, F., Edinburgh.
 STEPHENSON, F., Edinburgh.
 STEWART, A. K., Edinburgh.
 STEWART, F., Broxburn.
 STEWART, JAS., Dalkeith.
 STOCKMAN, R. D., Edinburgh.
 STOKER, D., Kirkcaldy.
 STORIE, R., Dalkeith.
 STRACHAN, W., Jedburgh.
 STRICKLAND, J. W., Dumfries.
 SWAN, W., Edinburgh.
 SYMINGTON, T., Edinburgh.
 TONER, J., Dunfermline.
 THOMSON, I. W., Edinburgh.
 THOMSON, J. P., Penicuik.
 THOMPSON, M. F., Edinburgh.
 THOMPSON, T. (Treasurer), Edinburgh.
 THURTELL, W. S., Hawick.
 TURNER, J., Kelso.
 WALKER, A., Edinburgh.
 WALKER, A., Edinburgh.
 WALKER, J., Edinburgh.
 WALKER, J., Galashiels.
 WATT, JAS., Haddington.
 WATT, JAS. (Jnr.), Haddington.
 WEATHERSTONE, F. B., Gorebridge.
 WELSH, T., Penicuik.
 WHITE, W. J., Edinburgh.
 WILKIE, H. F., Edinburgh.
 WILKIE, A. L., Galashiels.
 WILSON, ALEX., Mid Calder.
 WILSON, J., Edinburgh.
 WILSON, R. P., Dundee.
 WILSON, P., Edinburgh.
 WYLLIE, D. N., Edinburgh.
 YOUNG, J. R., J.P. (Chairman), Edinburgh.
 YOUNG, J. R. (Jnr.), Edinburgh.

MONDAY, 22nd AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 10 p.m., at the Waterloo Hotel, Edinburgh.

TUESDAY, 23rd AUGUST.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.; and at 2 p.m., adjourning at 4 p.m.

Order of Business.

Address of Welcome by the Right Hon. The Lord Provost of Edinburgh.

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hills' Library Fund."

President's Address.

Report of Unofficial Formulary Committee, by W. Martindale, F.C.S.

Reading of Papers and Discussions thereon.

PAPERS.

1. *Notes on Starch Digestion.* By G. A. GRIERSON, F.L.S.
2. *A New Antidote for Strychnine Poisoning.* By JAMES MACKENZIE.
3. *Note on the Purity of Commercial Salts of Lithium.* By WILLIAM MAIR.
4. *Valerianate of Zinc.* By W. A. H. NAYLOR.
5. *Carbo Animalis Purificatus, P.B.* By J. HODGKIN, F.I.C., F.C.S., F.L.S.
6. *Strychnine Salts.* By D. B. DOTT, F.R.S.E.
7. *Further Notes on Eucalyptol and Eucalyptus Oils.* By R. H. DAVIES, F.I.C., F.C.S., and T. H. PEARMAIN.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Waterloo Hotel.

At 4 p.m. members and friends, under the guidance of the Local Committee, were conveyed by brakes to Rosslyn, where the chapel of historic fame, profuse in architectural ornamentation, was inspected and admired. After tea the return journey was commenced, Edinburgh being reached shortly after 8 p.m.

WEDNESDAY, 24th AUGUST.

The Conference met at 10 a.m., adjourning from 1 till 2 p.m. The whole of the business of the Conference was completed this day about 4 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

8. *Note upon Ung. Hyd. Nit. Oxyd., P.B.* By FREDERICK DAVIS, B.Sc.
9. *Podophyllum Emodi.* By J. C. UMNEY.
10. *A New Method for the Estimation of Grape Sugar.* By A. W. GERRARD, F.C.S.
11. *Potassium Bromide.* By D. B. DOTT, F.R.S.E.
12. *Eugenia Jambolan: Its Influence on the Action of Diastatic Ferments.* By T. STEPHENSON, F.C.S.
13. *Experiments on the Alkaloid of Tea.* By A. H. ALLEN, F.I.C., F.C.S.
14. *Tests for the Purity of Chloroform.* By DAVID BROWN.
15. *Barbados and Curaçao Aloes.* By E. M. HOLMES, F.L.S.
16. *Vortmann's Test for Cyanides.* By H. BOWDEN.
17. *Laboratory Notes.*
 - (a) Quinine Phosphate.
 - (b) Barium Hypophosphite.
 - (c) Phosphoric Acid.

By GEORGE COULL, B.Sc.
18. *Note on the Melting Point of Cacao Butter.* By T. MALTBY CLAGUE.
19. *The Determination of Melting Points by Capillary Tubes.* By T. MALTBY CLAGUE.
20. *Notes on Tincture Menstrua—Tincture of Cinchona.* By E. H. FARR and R. WRIGHT.
21. *A Simple Pressure Filter, useful in "Mayer" Estimations.* By F. C. J. BIRD.
22. *The Action of Iodine on Phenol in Alkaline Solution under various Conditions, with special reference to the Estimation of Phenol Volumetrically by this method.* By T. R. CARSWELL.
23. *Microscopic Examination of some recent arrivals of Spurious Ipecacuanha.* By T. H. WARDLEWORTH.
24. *Concentrated Essence of Lemon.* By ARTHUR A. BARRETT.
25. *Essence of Lemon.* By ARTHUR A. BARRETT.
26. *Proximate Analysis of a sample of Myrobalans.* By A. CAMPBELL STARK.
27. *Note upon Lycopersicon Esculentum.* By FREDERICK DAVIS, B.Sc.

Presentation from "Bell and Hills' Fund."

Election of Formulary Committee.

Motion by Mr. J. C. C. Payne, Belfast.

Place of Meeting for 1893.

Election of Officers for 1892-3.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Waterloo Hotel.

At 4.20 p.m. a large party, consisting of visiting members of the Conference and their friends, members of the Local Committee and of the Ladies' Committee, proceeded in carriages to Inverlmond House, where they were entertained to tea by Mr. and Mrs. G. D. Mackay. From thence they journeyed to Dalmeny and the Forth Bridge, their route lying through the beautiful grounds of the Midlothian residence of the Earl of Rosebery. A number of the party returned to Edinburgh by rail and the rest by road.

THURSDAY, 25th AUGUST.

EXCURSION TO LOCH TAY. For particulars, see page 523.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT EDINBURGH, 1892.

THE Twenty-ninth Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, August 23rd, in the Waterloo Rooms, Edinburgh, E. C. C. Stanford, Esq., F.I.C., F.C.S., in the chair.

The following members and friends were present during the meeting :—

Aberdeen—Broomhead, G. E.; Clark, J.; Cruickshank, J.; Johnston, J.; McKay, J.; Paterson, J.; Strachan, A.; Strachan, A. L.

Arbroath—Jack, J.; Naysmith, A.; Robertson, J. M.

Bedale—Swinbank, J.

Belfast—Payne, Mr. and Mrs. J. C. C.

Birmingham—Jones, W.

Blackburn—Farnworth, W.

Bolton—Forbes, J. W.

Broughtly Ferry—Park, W.

Calcutta—McGregor, D.

Cardiff—Coleman, A.

Chester—Shepherd, T.

Clapham—Robertson, W. P.

Clifton—Berry, W.

Conway—Williams, W. G.

Dalkey—Beggs, Mr. and Mrs. G. D.

Dalmuir—Stanford, E. C. C.; Stanford, Mrs. and the Misses.

Dartford—Williams, W. Lloyd.

Dublin—Brown, Miss; Wells, Mr. and Mrs. W. F.

Dumbarton—Babtie, J.

Dumfries—Allan, W.; Sutherland, J. W.

Dundee—Anderson, A. B.; Mair, W.; Russell, J.

Dunfermline—Fisher, J. H.; Leath, A.; Tocher, J.

Eccles—Howie, W. L., and Mrs.

Edinburgh—Russell, J. A., the Lord Provost; Aitken, R.; Anderson, J.; Arthur, C.; Baxter, W.; Boa, Peter; Brown, A.; Brown, D. R.; Brown, J.; Bruce, A. G.; Burley, W.; Christie, R. A.; Clark, A.; Clark, W. Inglis; Coull, G.; Crowden, S. G.; Davies, W. A.; Dewar, F. L.; Dott, D. B.; Duff, W.; Duncan, W.; Ewing, J. L.; Ewing, Mrs. J. L.; Forret, J. S.; Fraser, J. J.; Gibson, A.; Hendry, R. L.; Henry, C. F.; Hill, J. R.; Keith, S.; Laird, W. H.; Lunan, G.; Macadam, J.; Macadam, N.; Macdonald, D. F.; Mackay, G. B. D.; Mackay, G. D.; Mackenzie, J.; McGibbon, G. L.; McLaren, D.; Milne, A.; Purves, S.; Richardson, W.; Smith, W.; Stephenson, J. B.; Stockman, R.; Swan, W.; Thompson, T.; Thomson, J. W.; Young, J. R., jun.; Young, Mrs.

Forfar—Fowler, G. R.; Simpson, A. H.

Forres—Fraser, A.

Glasgow—Kinninmont, A.

Hampstead—Pettinger, Mr. and Mrs.

Hawick—Maben, T.

Helensburgh—Harvie, G.; McMurray, J.

Hexham—Riddle, T. E.

Hitchin—Ransom, F.

Kirkcaldy—Storror, D.

Leamington—Hutton, H.

Leeds—Branson, F. W.; Broadbent, H.; Fairley, T.; Reynolds, R.

Leicester—Burford, S. F.; Butler, E. H.

Leith—Bowman, J.; Bowman, Mrs.; Coats, J. T.; Garvie, A.

Liverpool—Abraham, T. F.; Alexander, J.; Bain, J.; Buck, A. S.; Conroy, J. T.; Conroy, Mr. and Mrs. M.; Smith, J.; Stephenson, S.; Ward, J. S.; Wellings, W.

Lochee—Thompson, J. A.; Thomson, Mr. and Mrs. J. H.

London—Arkinstall, W.; Bascombe, F.; Bird, F. C. J.; Bowen, J. W.; Bremridge, R.; Collier, H.; Davies, R. H.; Fryer, C. A.; Garth, E. J.; Gerrard, A. W.; Hall, H. E.; Harvey, R. K.; Hills, W.; Hoare, W. R.; Hodgkin, J.; Humphrey, J.; Hyne, H.; Johnson, M. K.; Lambert, R. M.; Layman, C. N.; Layman, F. A.; Martindale, W.; Martindale, Mrs.; Mason, A. H.; McEwan, Mr. and Mrs.; Moss, J.; Naylor, W. A. H.; Parry, E. J.; Puckey, W.; Sangster, A.; Strother, C. J.; Tanner, A. E.; Taylor, G. S.; Tyer, T.; Want, W. P.; Weld, C. C.; Wright, T. R.

Louth—Simpson, H. D.

Manchester—Cooper, F. A. ; Hoseason, J. H. ; Kemp, H. ; Kemp, Mrs. ; Siebold, L.

Mauritius—Komplè, F. R. ; Marie, L. R. ; Jaques, L. V.

New Barnet—Young, R. F.

Newcastle-on-Tyne—Clague, T. M. ; Martin, N. H. ; Sharp, W.

Northallerton—Fairburn, H.

Norwich—Walker, J. H.

Nottingham—Bolton, Mr. and Mrs. C. A. ; Gill, Mr. and Mrs. W.

Partick—Rait, R. C.

Portobello—Nesbit, J.

Putney—White, E.

Radcliffe—Smith, J. T.

Salisbury—Atkins, S. R.

Saltaire—Bayley, Mr. and Mrs. G. H.

San Remo—Squire, F. R.

Selkirk—Borthwick, A. J.

Settle—Shepherd, J. W.

Sheffield—Allen, A. H. ; Furness, J. M. ; Ward, W.

Shrewsbury—Cross, W. G. ; Cross, Mrs.

Swansea—Grose, N. M. ; Hughes, J. ; Roberts, J. K.

Weymouth—Groves, T. B.

Wigan—Johnson, T.

York—Clark, J. ; Grierson, G. A.

MEETING OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held at the Waterloo Hotel, Edinburgh, on Monday, August 22nd, at 10 p.m.

Present :—E. C. C. Stanford (President), in the chair; Messrs. T. B. Groves, R. Reynolds, J. B. Stephenson, S. R. Atkins, W. Martindale, D. B. Dott, J. L. Ewing, A. W. Gerrard, J. Hodgkin, A. Coleman, and Peter Boa (Hon. Local Secretary) ; Mr. R. H. Davies (Hon. Treasurer) ; Messrs. W. A. H. Naylor and F. Ransom (Hon. Gen. Secs.), and Mr. M. K. Johnson (Assist. Sec.).

The minutes of the previous meeting were read and confirmed.

A draft report for presentation at the annual meeting was submitted by the Hon. Gen. Secs., and with slight amendments was agreed to.

The Treasurer's financial statement for the year 1891-92 was read and approved.

A proposed list of officers for the ensuing year was adopted for recommendation to the general meeting for election.

The draft programme for the proceedings of the sittings of the Conference was laid on the table and approved.

A letter was read from the Nottingham and Notts Chemists' Association, announcing that a deputation would attend that meeting to offer an invitation to the Conference to visit Nottingham next year.

The following sixty-two gentlemen were duly nominated and elected to membership :—

Alexander, W. G., Leith.	Harvey, R. K., London.
Anderson, A. B., Dundee.	Hendry, R. L., Edinburgh.
Anderson, Jas., Edinburgh.	Henry, C. F., Edinburgh.
Anderson, W., Stalybridge.	Heron, Jas., Edinburgh.
Aitchison, J. E. I., Edinburgh.	Hoare, W. R., London.
Aitken, R., Edinburgh.	Laird, G. H., Edinburgh.
Arthur, C., Edinburgh.	Leith, J., Rothesay.
Bartholomewsz, Dr. J. O., Ceylon.	Lunan, G., Edinburgh.
Bowman, J., Leith.	Macdonald, D. F., Edinburgh.
Brown, J., Edinburgh.	Mackay, W. B., Edinburgh.
Buck, A. S., Liverpool.	McDougall, R. J., Leith.
Burley, W., Edinburgh.	McGibbon, G. I., Edinburgh.
Chapman, W. G., Montreal.	McMurray, J., Helensburgh.
Clark, A., Edinburgh.	Mair, W., Dundee.
Clark, J., Aberdeen.	Ough, Lewis, Leicester.
Clark, R., Edinburgh.	Pinchen, W. J., Kilburn.
Crowden, S. G., London.	Ratnayeke, Dr. J. M., Ceylon.
Davidson, W., Aberdeen.	Richardson, W., Edinburgh.
Davies, W. A., Edinburgh.	Riches, T., Paignton.
Dunn, T., Selkirk.	Robertson, W., Arbroath.
Esam, R., Leicester.	Stead, J. C., London.
Finlayson, T., Leith.	Smith, J., Liverpool.
FitzHugh, R., Nottingham.	Smith, W., Edinburgh.
Forret, J. A., Edinburgh.	Sutherland, J. W., Dumfries.
Fowler, G. R., Forfar.	Swan, W., Edinburgh.
Fraser, A., Edinburgh.	Thomson, J. H., Lochee.
Fraser, Alex., Forres.	Tocher, J., Dunfermline.
Fraser, J. I., Edinburgh.	Walker, Jas., Saltcoats.
Fraser, R., Portobello.	Want, W. P., Lewisham.
Garvie, Alex., Leith.	Williams, W. G., Conway.
Gill, W., Nottingham.	Young, J. R. (jun.), Edinburgh.

GENERAL MEETING.

Tuesday, August 23rd.

The business of the twenty-ninth annual meeting of the Conference commenced on Tuesday morning, August 23rd, in the Waterloo Rooms, E. C. C. STANFORD, Esq., F.I.C., F.C.S., President, in the chair.

Mr. J. LAIDLAW EWING, in the absence of Mr. Young, introduced the Lord Provost, who attended to give the Conference an official reception. Mr. Ewing referred to the peculiar appropriateness of his lordship's presence, since he was a member of the medical profession and a Fellow of the Royal College of Physicians, Edinburgh, which had been long and honourably associated with pharmacy.

The LORD PROVOST (J. A. Russell) said a great many learned bodies had visited Edinburgh that summer, and it had been his lot on several of these occasions to receive them with words of welcome; but it was a peculiar pleasure for him to do so on this occasion, as he was somewhat connected with the Conference himself as a member of the medical profession, though not in practice. The British Association had just been to Edinburgh, and in welcoming its members he had to acknowledge on behalf of the citizens how much they were indebted to the students of pure science for the material advantages which that science conferred when translated into practice. On the present occasion he had to welcome those who were not merely representatives of one branch of pure science, but of that science in practice for the good of mankind. In no town known to him did all matters appertaining to the medical art hold a higher place of honour, nor had a greater number of citizens achieved distinction in connection therewith or with pharmacy. The presence of the Conference in Edinburgh, therefore, would be extremely grateful to the inhabitants, who recognised the good which the arts of medicine and pharmacy had done for the good old town, whose prosperity depended to a great extent on medical teaching. Pharmacy also was taught in Edinburgh with great success. Great improvements had been made in the art of medicine, especially in the precision with which remedial agents were prepared, the active principles being extracted by methods devised by chemists, and were thus able to be employed with much more certainty. Nay, chemists had even foretold the action of unknown substances and then set out to find them or build them up

by a process of synthesis. This was going beyond the greatest dreams of their predecessors, and no doubt by perseverance in the same course the next generation would have at its command potentialities for the treatment of disease which could not at present be even anticipated. He hoped something would be done at this Conference for the advancement of pharmacy, and he trusted that the subject of decent weights and measures would not be overlooked. The present system was a scandal to civilized mankind, and he hoped the members would do what they could to abolish it.

The PRESIDENT, on behalf of the Conference, thanked his lordship for the kind words of welcome he had uttered. It was twenty-one years since the Conference met in Edinburgh, but there were still those present who had not had time to forget the kindness and hospitality they then experienced. The chief magistrate of a town like Edinburgh must have his time very fully occupied, and he felt much indebted to him for his presence. They recognised in him, not only the chief magistrate of Edinburgh, but one of the foremost men in the higher rank of medicine. They were glad to know that in that city, at any rate, medicine and pharmacy had never clashed. They had gone hand in hand together, fighting shoulder to shoulder against the common foe, and had gained many a victory. He hoped this meeting would help to strengthen that bond of union, and then he could promise his lordship that all his expectations would be fulfilled, and that that city would be known more and more as one of the greatest centres of medical and pharmaceutical education. He could not promise him that they would get the metric system introduced, but they would all agree that it was very much required. He proposed a hearty vote of thanks to the Lord Provost, which was carried by acclamation.

The LORD PROVOST, in acknowledging the compliment, said he would give instructions to the Town Antiquarian to show any members of the Conference who would call at the City Chambers Private Museum, anything they had there, including some Burns MSS., old armour, etc., etc.

RECEPTION OF DELEGATES.

Mr. W. A. H. NAYLOR (Hon. Gen. Sec.) then read the following list of delegates :—

Pharmaceutical Society of Great Britain.—Mr. W. G. Cross, Vice-President; Messrs. Atkins, Grose, Harrison, Hills, Johnston,

Leigh, Martin, Martindale, Newsholme, Southall, and Stottar; the Editor, Sub-Editor, and Secretary.

Pharmaceutical Society of Great Britain (North British Branch).—Messrs. J. Laidlaw Ewing (Chairman of the Executive), T. Maben, J. B. Stephenson, and J. Rutherford Hill (Assistant Secretary).

Edinburgh Chemists' and Assistants' Association.—Messrs. J. Lothian, W. B. Cowie, and A. J. Dey.

Pharmaceutical Society of Ireland.—Messrs. S. D. Beggs, W. F. Wells, and C. C. Payne.

Dundee Chemists' Association.—Messrs. C. Kerr, J. Russell, A. B. Anderson, and W. Park.

Sunderland Chemists' Association.—Messrs. J. Harrison, R. Robinson, and T. Nasbet.

Nottingham and Notts Association.—Messrs. C. A. Bolton and W. Gill.

North of England Pharmaceutical Association.—Messrs. N. H. Martin, C. B. Ford, T. Rheeder, and J. Harrison.

Midland Counties Chemists' Association.—Messrs. Hutton, W. Jones, A. Southall, and J. Barclay.

Aberdeen and North of Scotland Chemists' and Druggists' Society.—Messrs. G. E. Broomhead, J. Johnston, J. Paterson, D. Ritchie, and A. Strachan.

Chemists' Assistants' Association (London).—Messrs. F. A. Rogers, W. L. Williams, C. Strother, J. C. Stead, and E. J. Parry.

Sheffield Chemists' Association.—Messrs. A. H. Allen, J. M. Furness, and W. Ward.

Manchester Association.—Mr. Louis Siebold.

Liverpool Chemists' Association.—Messrs. T. F. Abraham, J. Bain, M. Conroy, J. Smith, C. Symes, J. S. Ward, W. Wellings, and A. S. Buck.

Leicester Chemists' Association.—Mr. Burford.

LETTERS OF APOLOGY FOR ABSENCE.

The SECRETARY also reported that letters of regret at not being able to attend the meeting had been received from several gentlemen, including Professor Attfield (London), Mr. Charles Umney (London), who referred to the fact that he was one of Mr. Stanford's earliest pupils, Mr. Savage (Brighton), Dr. C. Symes (Liverpool), Mr. J. R. Young (Edinburgh), Mr. G. F. Schacht (Bristol), Mr. Daniel Frazer (Glasgow), Mr. G. C. Druce (Oxford), and Mr. F. B. Benger (Manchester).

Mr. F. RANSOM (Hon. Gen. Sec.) then read the report of the Executive Committee as follows :—

REPORT OF THE EXECUTIVE COMMITTEE.

In presenting the twenty-ninth annual report, your Committee feel that in order to maintain the position of the Conference as a representative organization of all who are connected with pharmacy, it is necessary that members, severally and generally, should avail themselves of suitable opportunities of making known to those eligible for membership the advantages to be derived from the Association. It is a matter for congratulation that at the meeting of the Executive held in Edinburgh last night, sixty-two gentlemen were elected to membership.

The question whether it is desirable to continue to meet in the same town and at about the same time as the British Association is to be discussed at this meeting. On the present occasion it was found impracticable to meet as usual immediately preceding the British Association, owing to the very early date chosen by the latter.

In February last, at the invitation of the Council of the Pharmaceutical Society of Great Britain, a meeting was held at which delegates from your Committee met representatives appointed by the Council of the Society, to discuss the suggestion that the Society should hold annual meetings at provincial centres, and to consider the probable effect that such meetings would have upon the Conference. At a subsequent meeting of your Committee it was reported that there appeared no promise that a further consideration of the matter would be likely to lead to any advantageous issue, and the subject may therefore, for the present at least, be considered to be closed.

The Conference has suffered a severe loss by the death of Emeritus Professor Redwood, which occurred in March of the present year. The help and advice received from Dr. Redwood in the early days of the Conference were of the highest value, and his continued interest was shown by his active participation in the meeting held last year at Cardiff. He occupied the position of President of the Conference in 1876 and 1877. His distinguished ability and long experience in all subjects relating to pharmacy gave him an authority in these matters which was recognised and appreciated throughout the world.

The Conference has also to deplore the loss by death of Mr.

Thomas Hyde Hills, a former Vice-President of the Conference. He was ever ready to promote the welfare of pharmacy in all its branches, and an evidence of his liberality remains in the Bell and Hills Fund, which annually provides for a presentation of books to the town visited by the Conference.

A second grant of £5, in aid of research, has been made to Mr. R. A. Cripps, who is continuing his investigations on ipecacuanha.

Mr. Louis Siebold, F.I.C., F.C.S., was last year reappointed editor of the *Year-Book*, and the MS. of Parts I. to IV. inclusive is now in the hands of the printers. Arrangements have been made which will, it is hoped, ensure the earlier publication of this volume.

The reception held last night by the President, and the conversazione which followed, were well attended, and proved as entertaining and attractive as any that have preceded them.

Mr. R. H. DAVIES (Hon. Treasurer) then read the financial statement as follows:—

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1892.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1891.	Dr.	£ s. d.
July 1.	To Assets forward from last year:—	
"	" Balance in hand at Bank	74 4 9
"	" Cash in Secretary's hands	1 4 2
"	" Messrs. Churchill's Account	110 3 3
1892.		
June 30.	To Sale of <i>Year-Book</i> by Publishers	18 0 0
"	" Advertisements, 1891 volume . . £89 13 6	
"	" " 1890 volume . . 4 6 6	
		<hr/> 94 0 0
"	" Members' Subscriptions, Amount received from July 1, 1891, to June 30, 1892	458 14 3
"	" Index Book, Sale by Publishers	0 4 8
"	" Liabilities on Outstanding Account, Messrs. McCorquodale & Co.	3 5 6
"	" Unofficial Formulary, Sale by Publishers	18 0 0
		<hr/> £777 16 7

1892.	Cr.	£	s.	d.
June 30.	By Expenses connected with Year-Book:			
"	Printing, Binding, Publishing,			
	etc.	£287	14	2
"	Postages and Distributing . .	29	9	1
"	Advertising and Publishers'			
	charges	25	13	0
"	Editor's Salary	150	0	0
"	Foreign Journals for Editor . .	5	15	6
				498 11 9
"	Unofficial Formulary:—			
"	Advertising	5	10	0
"	Publishers' Commission . . .	1	16	0
"	Printing	12	14	7
				20 0 7
"	Sundry Expenses:—			
"	Expenses of Assist. Sec. at			
	Cardiff	10	0	0
"	Grant in Aid of Research . . .	5	0	0
"	Copies of President's Address .	0	11	9
				15 11 9
"	Assist. Sec 's Salary from July			
	1, 1891, to June 30, 1892 . .	40	0	0
"	Rent of Office	10	0	0
				50 0 0
"	Blue Lists, Printing	3	5	6
	Postages	2	15	3
				6 0 9
"	Postages	13	2	3
"	Printing and Stationery	11	13	0
"	Bank Charges, as per Bank Book .	0	0	6
"	Petty Cash Expended	3	15	3
"	Liabilities of last year, since paid .	3	4	6
"	Outstanding Assets—Messrs.Churchill's Account	97	5	8
"	Balance at Bank	£56	19	2
"	Balance in Secretary's hands . .	*1	11	5
				58 10 7
				£777 16 7

* For Postages, 5s. 9d.; Petty Cash, £1 5s. 8d.

The Bell and Hills Fund.

1891.		£	s.	d.	£	s.	d.
July 1.	To Balance in hand	16	12	8			
	„ One Year's Dividend on Consols	9	13	4			
					26	6	0
Oct. 6.	By Purchase of Books for Cardiff				10	4	2
					16	1	10
Assets	{ Cash—Balance at Bank			16	1	0	
	{ Consols			360	0	10	

Audited and found correct { D. ANTHONY, Cardiff.
T. THOMPSON, Edinburgh.

Mr. DAVIES said that the income from subscriptions was about £18 less than last year, but expressed a hope that the accession of so many new members would redress the balance.

Mr. THOMPSON (Edinburgh), one of the auditors, testified to the correctness of the accounts.

The PRESIDENT moved that the report of the Committee and statement of accounts be received and adopted.

Mr. DOTT seconded the motion, which was carried unanimously.

The PRESIDENT then gave the following address:—

THE PRESIDENT'S ADDRESS.

Gentlemen,—I have in the first instance to thank the Conference for the kind expression of confidence in electing me at Cardiff, in my absence, to the honourable position of President.

When your Committee first selected me I declined the honour, deeming it impossible that an outsider like myself could do justice to the cause, and that a brilliant flash of silence would suit me best. My friends in the Committee would, however, take no denial, pointing out that I should only follow some former Presidents, who also were not personally engaged in the practice of pharmacy. Moreover, as one of the founders of the Conference, present at the first meeting at Newcastle in 1863, and assisting at its birth, it was my duty to do anything and everything in my power to promote its best interest. That duty I fully recognise, and accept as a very pleasant one, hoping to follow, though a long way after, the eminent outsiders who have preceded me in this chair. I trust that all shortcomings may be made up by your kind assistance. It is said that outsiders often see the best of the game, and I shall claim the privilege of a sympathetic looker-on and perhaps *even dare* to criticise some of the moves.

It may also be interesting to "see oorsells as ithers see us," although it is said we do not often want to repeat the experience. I represent a part of that great public, which has already profited so largely by the growth of pharmacy, and the increased education of pharmacists, and which has placed a great trust in your hands, and is waiting and watching to see how you keep it. A roving commission and a rambling statement must be allowed me; that of a "chiel amang ye takin' notes," a position which would make me rather nervous were it not for the very excellent unwritten rule that this meeting does not criticise the President's

address except favourably, and you have placed me in the chair to see that your rules are properly respected.

First Meeting.—The memory of that little inaugural meeting held in a small room at Newcastle in 1863, the year I came to Scotland, supplies me at once with a suitable text. Twenty-one pharmacists who attended the British Association there met together and founded the British Pharmaceutical Conference. Twenty-nine years have passed away, and each year has added to its progress. In 1871, when the Conference met last in Edinburgh, it was eight years old, and even then had arrived at years of discretion. I congratulate the members that they are again invited to this beautiful city, and receive another hearty welcome to modern Athens, and those of us who were present on the last occasion know well what that means. We who nursed this bantling in its infant stage could scarcely have expected that it would have grown so rapidly, and so great, and that the *Year-Book of Transactions* should be looked forward to as an indispensable record of the world's progress in pharmacy.

Indeed, so proud may we be of our offspring that I thank our friend Reynolds for his kindly hint about "garrulous old nurses." I think it may be worth our while to pause for a moment and look back to our birth year, and see what the interval has done for us, and for our country at large, embracing as the period does, the latter, the greater, and the better half of the Victorian era. What progress has the world around us made in science, in manufactures, in education, and has our pharmacy kept pace with the general advancement? Can we put down our Ebenezer here, and thank God and take courage as we look forward to greater possibilities?

Losses.—Looking back has its elements of regret. Our attention is at once rivetted on the serious gaps made in our ranks by the hand of death, those eminent men, those dear friends who have joined the majority, "where beyond these voices there is peace." Who can fill the vacant spaces where Deane and Brady stood at our first meeting? The first volume of the Transactions contains a paper by Deane on the opium alkaloids, with microscopic illustrations beautifully drawn by Brady, whose monograph on the *Challenger* foraminifera will alone hand down his name to posterity. We have lost the world-renowned Hanbury, who presided in 1867 and 1868 at Norwich and Exeter; Stoddart, who presided in 1870 and 1871 at Liverpool and Edinburgh; Williams, who presided in 1884 at Hastings; and last and greatest of all,

Redwood, who presided in 1876 and 1877 at Glasgow and Plymouth. Since our last meeting our generous friend Hills has passed away. We have also lost our dear friend John Mackay, who was Secretary when we last met here, whose genial presence we miss so much, and whose loss to pharmacy in Scotland is irreparable. One quality was specially notable in all, they were such lovable men:—men with a halo around them, shedding light and love on all who came within their benign influence, men abounding in an enthusiasm which was wonderfully catching, and went far to secure the great success which has always attended the meetings of this Conference.

Redwood.—The lamented death of Professor Redwood, the Nestor of British pharmacy, is so recent that we have not yet got over it. He was long spared to us, with his wonderful talents and his great vitality, preserved to the last, even to our last meeting at Cardiff, in his native Glamorganshire; but soon after there was a noise amongst us “as when a standard-bearer fainteth,” and we can scarcely yet realize that our great champion has retired from the field. No one knows the inner character of a professor better than his assistant, and having for some time held that happy and intimate association, I wish to record that a warmer friend and a more lovable and unselfish man I never knew. In the present position of British pharmacy he has left us a noble legacy, and his name is commemorated by the Redwood scholarship now connected with the Research Laboratory, but many of us “will long for the touch of a vanished hand and the sound of a voice that is still.”

Conference.—The British Pharmaceutical Conference is “an organization for the encouragement of pharmaceutical research and the promotion of friendly intercourse among pharmacists.” Has it fulfilled these promises? The goodly volumes of Proceedings already published, of which twenty volumes have been issued since we last met here, supply the answer to the first. The subjects treated are so extensive that it was necessary to supply a general index to the first sixteen volumes, and another will soon be required; while the fact that we are meeting for the second time in this city, and for the fifth time in Scotland, where all the meetings have been specially successful, at least shows that even in pharmacy many have run to and fro, and knowledge has been increased.

We again shake hands across the border, and our southern friends will find once more that there is plenty to see and admire

in the "knuckle end of Great Britain," the "Land of the mountain and the flood." But this Conference has not only brought together British pharmacists, it has brought us in close connection with distinguished pharmacists abroad of every nationality. It has given us a respect and esteem for one another, and by the excellent researches published in the *Year-Book* has raised the tone of British pharmacy wherever our language is spoken throughout the world. In the Blue List carefully prepared and annually circulated, attention is called to many subjects deemed worthy of investigation, and where our present knowledge is imperfect. I claim for the British Pharmaceutical Conference that it has amply fulfilled all its promises.

Progress.—I shall not attempt to enumerate the special advances made in pharmacy during the past year, that would be anticipating the admirable summary of the Editor of the *Year-Book*; nor shall I follow my accomplished predecessor in speaking of new remedies, but only remark that no physician nor pharmacist can afford to order a suit of clothes without a pocket specially made to contain the last edition of Martindale's "Extra Pharmacopœia."

National Progress.—I prefer to select a few subjects which may give us an idea of progress during the life-time of this Conference. During this period the trade of the country, as shown by the imports and exports, has nearly doubled.

The parcel post, the sixpenny telegram, the telephone, the phonograph, the microphone, and the typewriter (unfortunately not yet used for prescriptions, though perhaps it would save more time in that than anything), have all been added since our birth-year. We had few ocean telegraphs then, and the first Atlantic cable was still lying useless at the bottom of the ocean, where now there are seven lines in constant use. The telegrams have risen from 10 millions to 69 millions, the letters from 617 millions to 1,767 millions, the shipping from 24 million tons to 38 million tons, and the savings banks from £44,000,000 to £108,000,000, and the applications for patents from 3,309 to 21,308. The tramways are all of our period. They extend to over 1,000 miles, with a capital of £14,000,000. The cable tramway in this city is a late development. The railway capital has increased from £474,000,000 to £1,004,000,000, and the passengers from 204 millions to 817 millions, but the number killed has fallen from 1 in 5 millions to 1 in 53 millions. This immunity from accident is due to inventions of our period, to the steel rail, the fish joint, the block

system, and the continuous break; and as thirty times as many are said to be killed in the streets of London, our metropolitan visitors, when they come here in the luxurious carriages of our "Flying Scotchman," may feel that they are escaping from danger to safety. Our great railways have only deteriorated in one respect: they do not now give us the privilege of travelling to these national gatherings and back at a single fare. In the good old times when the present reign commenced, the fast coach from London took $45\frac{1}{2}$ hours, now messengers on bicycles would easily beat this record; truly the present times are the oldest and the best. Our great ocean steamships present another instance of greater efficiency and higher speed producing also greater safety to travellers. The tubular boiler, the twin screw, the surface condenser, and the triple expansion engine, all inventions within our period, have raised the speed from fourteen knots an hour to above twenty, the boiler pressure from 25 lbs. to 150 lbs., the horse-power from 3,000 to 20,000, while the consumption of coal has fallen from $3\frac{1}{2}$ lbs. per indicated horse-power to $1\frac{1}{2}$ lb., and the weight of the machinery per horse-power is reduced to less than half; and these improvements have only made the Atlantic greyhounds "parent safeties," for the cabin is the safest place in the world. Those of our friends who go on to the West Highlands will find steamers where every luxury can be obtained, very different to those I remember.

Gas.—We then knew gas only as our chief means of illumination, and it is but recently that we have learned how to secure a maximum of light by improved burners. In this, the centenary year of its discovery by Murdoch in Ayrshire it is humiliating to know that most of it is still wasted in this way. We now look upon gas as an important source of heat; it is especially valuable in pharmacy and in cooking. In some of our largest manufactures, as glass and steel, the firing is entirely done by producer gas in connection with the Siemens regenerative furnace. There is yet great room for development in the supply of a separate cheap gas entirely for firing purposes, and the use of petroleum oil gas for illumination. We have also the most efficient of all motive power in the gas engine, now available up to 300 horse-power. We have lived to see gas spontaneously rising with a pressure of 400 lbs. to the inch from bore holes, and utilized for heating and lighting in Pittsburgh to the extent of 10 million cubic feet a day. Gas would be little use without matches, and as these are said to be the measure of civilization, we may be reminded that they

were invented by a chemist and druggist in 1827, John Walker, of Stockton, who sold them in boxes of fifty for a shilling, and now our country alone turns out 300 millions every day, and the world's annual production is estimated at £21,000,000.

Electricity.—Electricity is rapidly becoming our servant of all work. It promises soon to be our principal light; it supplies the motive power for railways, tramways, vessels, and an innumerable variety of smaller motors. It is used for cooking, for electroplating, for reduction of metals, for welding iron and tempering steel, for working coal-mines instead of compressed air, down to Edison's method of killing cockroaches and caterpillars by electrocution. And now it is supplied by meter and measured as easily as gas; in fact, in the United States, a customer was fined 5,000 dollars for stealing it—a new fraud, not easy to commit everywhere. The incandescent light is inseparably associated with the name of Swan, one of ourselves.

Water power is largely used for generating electricity; even a portion of Niagara Falls is to be utilized. According to Siemens, it is equal to $4\frac{1}{2}$ million horse-power, which represents all the steam power in the world. The Scaffhausen Falls on the Rhine are utilized to generate electricity used in the reduction of aluminium; and the falls of Tivoli light 40,000 lamps, 18 miles away.

Steam.—Four-fifths of the world's steam-engines have been made during our period; and the demand is greater than ever, and the consumption of coal goes on ever increasing, and our stock must be some day exhausted, even in fifty years it may become scarce, then we must look for other sources of power. The waves, the rivers (the Mersey alone is estimated at 100,000 horse-power), the tides, the heat of the sun, all may have to be pressed into our service.

Hygiene.—The important science of hygiene has grown up during our period, and we now know that cleanliness is not next to, but a part of godliness; that the dirty saints of the middle ages were unsafe, and that the Mosaic law was as good for health as for morals. Most of the mysterious visitations which used to be called dispensations of providence, we now know to be simply preventible deaths, arising from our own neglect. The origin and development of many fatal diseases then unsuspected, are known now. The whole treatment of disease has therefore changed. An accomplished nurse is as necessary now as a good physician. Nursing, then left in the hands of a low class of ignorant servants, is now engaged in by some of the noblest, best educated and most

devoted women in the land. The ambulance associations are all of our period, and it is now rare for any accident to occur without some one being present who is able to render "first aid," that important service which has saved so many limbs and lives.

The medical officers of health for Edinburgh and for Glasgow were both appointed in our birth year; but the Public Health Act (Scotland) was not passed till 1867. These officers soon showed good cause for their appointment. At that time the upright streets (as Sir E. Chadwick called the tall tenements of the older part of this city) were subject to periodic outbursts of fever. The death-rate was over 26 per 1000. The last decade it was only 17·5, a saving of nine lives per thousand.

Glasgow was still more remarkable, because there was more to do. The death-rate was over 30 per 1000, of which the chief zymotic diseases were 6·5; in the next decade the death-rate was reduced to 28, and the chief zymotic diseases to 4·3; in the last decade the death-rate was still further reduced to 24, and the chief zymotic diseases to 3·1, or less than half. This saving of six lives in 1000 amounts on the present population of greater Glasgow to 4,048 lives annually saved. The sanitary department costs £45,721 per annum; besides the cost of the cleansing department, which is over £100,000 more; all well spent in the noble service of fighting disease and death. The fourth and last fatal attack of cholera occurred in 1866 and caused 53 deaths, as compared with 3,885 deaths in 1853. The authorities do not dread this terrible epidemic now. No new house is allowed to be occupied unless the drains have been smoke-tested and found perfect, and the Glasgow Police Act is extremely stringent.

In 1849, 14,000 deaths from cholera were traced to the drinking of impure water. Only last month Pasteur called attention to the great danger arising in Paris from the use of ice from impure water. Glasgow owes much of its supply to Loch Katrine water, obtained at a cost of £3,300,000. Liverpool has just obtained a pure supply from Wales at a cost of £4,000,000, and now we hear of Birmingham contemplating an expenditure of over £6,000,000 for the same wise purpose. Perhaps we may hear next of the great metropolis taking its water supply in hand.

It was estimated that during two days of the fair week over 3,000 hot baths were given in the five public baths in Glasgow; and yet our public baths and water supply are nothing to those of ancient Rome. There is much to be done yet, as 125,000 lives are still annually sacrificed to preventible diseases in this

country. Sir Joseph Fayrer estimates the loss of labour alone at £7,750,000.

Chemistry.—We have seen chemistry, a science founded on the balance, and the weights and volumes of atoms and molecules, leaving our earth altogether, and analysing the atmosphere of the sun and other stars, and even assisting in determining their size, distance, and velocity. Our notation has entirely changed, and those who attended our first Conference have had to re-learn their atomic weights, and combining equivalents; and if the names of the endless new organic compounds continue to increase in length, we may have to study a new alphabet. We do not yet know the elements as multiples of hydrogen, but much has been done to cast more than a doubt on their simple character; and it is probable that some at least may be dissociated into simpler forms.

Photography.—From the invention of the instantaneous gelatine plate, photography has undergone a revolution and become an almost universal national toy; and the sales of apparatus and chemicals must be enormous. In the manufacture of albumenized paper three factories in the United States are said to use 3,000,000 eggs per annum. It has attained a marvellous development in astronomy, and natural colours are in sight at last. Professor Boys showed here that a photograph could be obtained in a ten-millionth part of a second.

Microbes.—The greatness of little things has been very forcibly brought home to us in the discovery of the micro-organisms or bacteria, and the large and important part these minute bodies play in our daily life. It is well our eyes are not microscopes, and we cannot see these organisms and what they feed on in the air; the outlook would be too dreadful, but we are not allowed to forget the omnipresence of an atmosphere with all its impurities. Some of our largest manufactures—bread, wine, beer, spirit, and vinegar—are all the products of various bacteria, inducing fermentation. The effects at least have been known from the deluge; we are not told of each kind how many Noah took into the ark with him, but they were certainly present when he landed, or his grape juice would not have affected him so powerfully.

Manufactures.—I can only select one or two of the larger chemical manufactures to illustrate progress, and such as are allied to pharmacy. Sodium carbonate and bicarbonate have developed into that enormous manufacture known as the alkali trade, which during our period has attained great development. In the early part of this century sodium carbonate was made from

kelp, and I calculate that it must have cost at least £100 per ton from that source. It is a singular fact that the new process for making soda ash, known as the ammonia soda process, was first introduced for the manufacture of sodium bicarbonate for use in pharmacy. It is a simple method of decomposing sodium chloride with ammonium bicarbonate; it was patented by Dyer and Hemming in 1838, a company was formed to work the process in London, but it failed entirely, the decomposition was not perfect, there was great loss of ammonia, and the cost of ammonia salts was too great at that time.

Many other similar patents were taken out, but the first practical result was obtained by Solvay, who exhibited sodium carbonate made by this process in the Paris Exhibition of 1867. In 1889 Solvay and Co. in their various works abroad made 400,000 tons, equal to half the world's consumption. Meantime Brunner, Mond and Co. had established most successful works at Northwich, where they have a brine well, which is necessary to this process, and other works are being erected. According to the alkali report of last year, 278,528 tons of salt were decomposed by this process, against 567,863 tons decomposed on the old Le Blanc process. In the ammonia soda process the soda is first produced as a bicarbonate, and the soda ash obtained from this by roasting; thus a small pharmaceutical product has developed into an immense industry. This result is almost entirely due to a new science, that of chemical engineering, which is a growth of our period; it enables us to overcome the great practical difficulties in the erection of chemical plant on a large scale. It is to this science we owe the filter press, the hydro-extractor, the vacuum pan, the multiple evaporator, better disintegrators, and many others, which have aided manufacturing chemistry and pharmacy. Thus the old Le Blanc process, which has held its own all this century, has now a formidable rival by which soda-ash is made much cheaper, and it is only able to hold its own because it is still practically the only source of hydrochloric acid which, since the passing of the Alkali Act, also in our birth year, has all been collected. In the ammonia soda process the whole of the chlorine is run away as calcium chloride, whereas in the Le Blanc process half of the chlorine is obtained in the form of bleaching powder, now 140,000 tons per annum, which at the beginning of this century realised £112 per ton. The other half of the chlorine is still wasted.

Sulphur.—Another great drawback to this process was the large

and offensive outcome of alkali waste, containing the whole of the sulphur, from the vitriol employed to decompose the salt. In Widnes alone there is a deposit of 10,000,000 tons, covering 500 acres of ground, the drainage from which is most offensive. This deposit will now cease, for by the Chance process the sulphur is recovered in a very pure form, and the waste is rendered innocuous. 45,000 tons were produced from this new source last year, and it is rapidly increasing. Brimstone and treacle is not the fashionable medicine it used to be; it never belonged to elegant pharmacy; but should the taste for it be revived, it is well to know that a sufficient quantity can be produced at home.

Sulphate Ammonia.—Closely connected with the ammonia soda process, and affording the basis of several important medicines, is the manufacture of ammonium sulphate, and it has attained large proportions, especially in Scotland. At one time urine was almost the only source. Ammonium bicarbonate was made not long ago from the urinals of Glasgow, then gas liquor, from which the greater part of the 143,606 tons made last year in this country was obtained. 26,600 tons of it were obtained from the distillation of Scotch shale, and 6,290 tons from a new source, the waste gases of the Scotch blast furnaces. 57 of these furnaces which used to flare and flame all day and light up the nights, and were generally known as "blazes," have been tapped at an expense of £444,600, and the tar and ammonia condensed; and in some of these the products pay better than the iron. That chemical engineering is required here may be estimated by the fact that in one works alone 100,000,000 cubic feet of nearly red-hot gases are dealt with every day.

Shale Oil.—This great Scotch industry is entirely the growth of our period; in it shales, formerly useless, are converted into paraffin, lubricating and burning oils, and ammonia. Several millions of capital are employed in this trade, and over fifty-five million gallons of crude oil were distilled last year from 2,311,592 tons of shale, and its development has required the highest talent, and is a triumph of chemical engineering. The devising of refrigerating machinery for compressing the gases and condensing the volatile hydrocarbons led Coleman, who was trained in pharmacy, to the discovery of the celebrated Bell-Coleman refrigerator, one of the greatest successes of the present century. From it arose that enormous importation of dead meat from abroad, which last year amounted to 3,323,821 carcasses of frozen mutton alone, all of which were brought through the tropics and landed in perfect condition.

Petroleum.—This shale industry has now a still more gigantic competitor, the petroleum of America, Russia, and many other parts of the world. The production in 1889 was seventy-five million barrels, or ten million tons, of which United States produced forty-five million barrels, and Russia twenty-five million barrels. It is estimated that there are ten million paraffin or petroleum lamps used in this country alone, and the poorest cottage in the kingdom has a cheap and efficient light. An excellent petroleum gas engine has been introduced, and is highly spoken of as a motor. This petroleum will probably be much more used as a fuel, as it has been solidified, and also as a means of enriching coal gas. We are specially interested in knowing the name of Redwood as the best authority on this subject.

Natural Products.—Many of our chemical manufactures have been superseded by the discovery of natural products. The mines of Stassfurt now furnish the bulk of our potash salts and of our bromine, which is found also in a natural deposit in America. Large salinas or beds of pure salt have been found in the Argentine, borates in California, and sodium sulphate at Wyoming, and the arid mountains of Chili produced last year 945,000 tons of nitrate of soda and much iodine.

Colours.—The chemistry of the coal tar colours was then in its infancy. We now see every shade of colour from this prolific source. From anthracene, discovered by Dr. Anderson, of Glasgow University, alizarin has been produced in such quantity as to entirely supersede the madder plant, and free for growing corn the many acres of land then required for its cultivation. Indigo has also been produced artificially, though not yet so cheaply as to supersede that from cultivation.

Pharmacy has profited largely by the constant researches into this mine of chemical wealth. Its products appeal to all our senses, our sight is gratified by the beautiful colours, our taste by the sweetness of saccharin, our smell by the odour of artificial musk; we can feel the sting of carbolic acid, and our hearing is satiated, even tired by the endless long names it has given to us.

Quinine.—The object of the research which led Perkin to the discovery of mauve, the first of the tar colours, the pursuit of artificial quinine, is not yet accomplished, except from cupreine, for which a German patent has been obtained. But is it not highly probable that it may yet crown the magnificent edifice raised on a basis of tar, that sometime troublesome substance, which long ago led to Bishop Berkeley's speculation on matter,

and which he recommended as a cure for all diseases. It was prophetic, could he possibly have foreseen such antiseptics as carbolic, cresylic, and salicylic acids, or such febrifuges and anodynes as salicin, antipyrin, antifebrin, and phenacetin.

The history of tar products should form a good sign-post to all young researchers who deal with unpromising materials, and who may be sure that perseverance will find the reward that invariably results from all patient labour. It is painful to reflect that the bulk of these manufactures of finer chemicals is in the hands of German chemists, who are still ahead in the education necessary for this work. Our nation, however, has often well fought a losing battle, and converted it into a victory, and let us hope we may do this yet.

Education.—In nothing has our progress been more marked than in education. We had then no board schools, no free libraries, and less than half the children in London attended school. Now there are 2,590 board schools in Scotland alone, and the expenditure last year was £1,651,490. Of this amount about one-fifth is expended in the cities of Edinburgh and Glasgow, and these cities possess schools which are equal to any in Europe. We may hope that there will be no illiterates in the next generation. The School Act of Scotland is a more extensive one than that in England, empowering the boards to teach everything; and board schools are almost universal here. In fact, for nearly two hundred years, Scotland in her parochial school system has had a State education. Macaulay says that "Scotland was then the rudest and poorest country that could lay any claim to civilization; the very name of Scotchman was then alluded to with contempt. Fletcher, of Saltoun, said that nothing but the lash and the stocks could reclaim the vagabonds who infested every part of Scotland, and recommended that course in a pamphlet. A very different remedy was adopted. The Parliament which sat at Edinburgh (we were then under home rule) passed an Act for the establishment of parochial schools. What followed? An improvement such as the world has never seen took place in the moral and intellectual character of the people, and the Scotchman of the eighteenth century was an object not of scorn, but of envy, because the State had given him an education."¹ We know how many great Scotchmen these schools have distributed to leave their mark all over the world.

¹ Macaulay's Speech on Education, 1844.

Now the whole country has a State education, and Wordsworth's prophetic lines are fulfilled:—

“ Oh, for the coming of that glorious time,
When prizing knowledge as her noblest wealth
And best protection, this imperial realm,
While she exacts allegiance, shall admit
An obligation on her part to *teach*
Those who are born to serve her and obey.”

But we have yet much to do in secondary, technical, and university education. Great Britain has only nine Universities; of these the London University is little more than an examining body, and all must look forward to the time when the greatest city in the world will have a real teaching university worthy of it. With a less population than London we have four of these universities, and although capable of some reforms and extension, Scotland has reason to be proud of her colleges. In Glasgow we have the largest school of technical education in the kingdom, with 2,800 students, so that although England is rapidly overtaking us so far in free, cheap, universal unsectarian education it is “Scotland yet.”

But Germany has twenty-three Universities, and when she acquired the city of Strasburg, she immediately fortified it not only by guns on the outside, but by building a splendid university within the walls. Now we have handed over Heligoland, she at once sets to work with a biological department to inquire into deep sea fisheries. We are at last moving in this department, and perhaps it is time, after fishing for so many centuries, for our fishermen to learn something about the habits of fish. Even our plumbers must now be educated, examined, and registered, seeing that they can become efficient distributors of poison without our knowing it. The growth of free libraries, under the Libraries Act, is well seen here by the splendid free library. We have two fine free libraries in Glasgow due to private benevolence, but we want several more, and we have not yet induced our citizens to adopt the Act, small as the necessary assessment is.

The formation of the large Society of Chemical Industry, with its splendid Journal, for applied chemistry, the Institute of Chemistry for professional examination, and the Society of Analysts, all in our period, all show the great progress and the many special directions in which education in chemistry is extending. Organic chemistry requires much more extensive teaching and many more teachers than we have at present, and we must

look for a great increase, and perhaps several divisions, in this branch of education.

Pharmaceutical Education.—Have we then kept pace with this universal run for knowledge going on around us? To a great extent we have. There are now pharmaceutical associations in South Australia, Queensland, Tasmania, New Zealand, South Africa, and Otago. But it is complained that many young men who try to pass the examinations of the Pharmaceutical Society in London have not been properly educated at school. Dr. Stevenson, the Government Visitor, says about the Preliminary examination, "It is evident that many young men of defective education still unsuccessfully attempt to enter upon the business of pharmacy, most of them failing in simple arithmetic." I am glad to hear that the attempt is unsuccessful; it is unfair to put any uneducated youth into pharmacy—unfair to himself, because he is entering a business the professional part of which requires the highest education, and unfair to pharmacy, because he lowers the tone of what ought to be a scientific profession. Of the Minor examination Dr. Stevenson says, "The ill-effects of attempts to acquire knowledge haphazard, and without systematic teaching, are painfully apparent." The same remarks apply to the examinations here, but the percentage of failures is less. Now this is nothing more nor less than "cram," that hideous spectre which haunts all examinations, and makes us wish to find some better substitute for testing knowledge. When will our young men learn that even if they pass, such knowledge can never be of any use to them, but that is not the worst, it is no use to their fellow-men, which is much more important. Knowledge crammed for an examination is of no more value to the mind than undigested food is to the body, it imparts weakness not strength. It is like a Latin lesson which an idle boy learns to escape the cane or the tawse, and when the ordeal is over he speedily forgets both. Dr. Stevenson, however, adds that "the capabilities of the candidates will be better tested by the new examination," and I hope his expectations will be fulfilled.

I am surprised occasionally to hear some talk of over-education in pharmacy, especially in Scotland, the country that owes her great position entirely to education. I notice those who talk so freely about over-education do not suffer severely from that complaint themselves. If a pharmacist can be over-educated he occupies a perfectly unique position, unapproached by other men. We often hear of over-educating the people. I consider that

impossible. It is well known to school inspectors here where the children are fairly intelligent, that the clever ones do not number more than 4 to 5 per cent. at the outside, and these only *can* be over-educated; as to the others, the great difficulty is to educate them at all. I speak as the Chairman of a School Board which possesses one of the largest schools in the kingdom.

The artisans of to-day know more than the middle class did in the last generation; and I hold that the Pharmaceutical Society have always been right in giving the first place to education, for that and that alone will elevate pharmacy. It is the only means yet discovered that is always sure to help people to help themselves, and it must begin early. "The time to get ready a ship for the storm is not when the hurricane is on, but when the planks are being picked and the bolts driven home in the dockyard. Build a boy of sound timber, and he will weather most things."¹

Pharmacy.—But some think there is no inducement in the present and future of the pharmacist to repay liberal education. I have no doubt there is now some truth in this, and that his claims are not properly recognised and rewarded; the public recognition may be tardy, but it may be all the more generous when it comes. Much progress in pharmacy has marked our period. Many of us remember with a shudder the awful powder, the very thought of which haunted our young dreams, taken in some kind of jam, and which gave us a growing horror of that particular variety of preserve which we have never got over. That does not represent the elegant pharmacy of to-day, and our children can take it in a tabloid; much has been done, and more will yet be done, to make the administration of nauseous medicine more agreeable.

The pharmacist deals with fearfully destructive weapons, and requires a good deal of the "*suaviter in modo*" to cover his "*fortiter in re*." He deals in the oldest of all chemistry, that of medicine; his alchemist ancestors worked early and late to find the elixir of life, he is equally industrious, and much more successful in his constant search for preventives of death. He is the only person legally allowed to call himself chemist in this country, but, perhaps, he may yet alter his cognomen. Pharmaceutical chemist is too long, pharmakeutical is too dreadful, pharmacist is not euphonious. I would suggest pharmacian as being more like physician and surgeon, and that his shop, as suggested long ago

¹ Professor Drummond.

by Ince, should be called pharmacy. Judging by the necessity of a *carte de visite* being required to secure a situation, I assume that in his younger days, at any rate, he must be good looking, and I am not aware that this is an indispensable qualification of any other variety of chemist. But as some of the fair sex are qualifying to take his place, this may put him at a disadvantage. An anomaly exists in Scotland in pharmacists not being secured, as they are in England, from serving on juries. A letter received recently from the late Lord Advocate convinces me that this has only to be properly represented to be redressed.

Poisons.—In a free trade country we are all agreed that there shall be no free trade in poisons; and that those only shall be allowed to dispense them who have passed the stringent examinations of the Pharmaceutical Society. The public themselves can judge of the value of groceries, of which the more sales the better; and if they are taken in, it is their own fault: but they know nothing about medicines, of which the less sold the better for them. They may buy a second quality of the one if they want something cheaper; but there ought to be no second quality of the other; that must be purity itself and above suspicion. The average Briton is not to be trusted with stimulants, much less with more powerful poisons.

We refuse to sell pistols to infants and poisons to ignorance. The pharmacist does not yet get fair play; grocers and many other dealers have been allowed to traffic in poisons, open doctor's shops, and compete with him in the sale of medicine; and then the great co-operative trawler bears down upon him and nets everything; not only from a side of bacon to a chest of drawers, but assumes the right also to physic and poison, as well as feed, clothe and furnish everybody. The capital of these co-operative societies has increased during our period from £656,640 to £13,721,008, and the annual sales from £2,500,000 to £38,000,000.

During the past year, however, considerable progress has been made in asserting the rights of the pharmacist as against the sale of poisons by unqualified persons. The prosecutions in Glasgow by the Pharmaceutical Society of some of the open doctor's shops have revealed a low state of medicine in that great city; which, fortunately, we look for in vain elsewhere.

Glasgow.—In going over the pharmaceutical register, I was surprised to find that there are only 15 pharmaceutical chemists in Glasgow, against 37 in Edinburgh. I append the numbers in five of the largest cities and towns in Scotland.

	Pharm. Chemists.	Population.	1 Ph. C. in
Greater Glasgow . . .	15	656,200	41,012
Edinburgh	37	261,261	7,061
Perth	2	29,902	14,951
Aberdeen	10	112,923	11,293
Dundee	4	140,696	35,164
All Scotland	119	4,033,103	33,891
London	507	4,231,431	8,346

This table supplies an object lesson in Scotch pharmacy, and shows that the higher qualification of the Pharmaceutical Society has not been attractive in Scotland generally. There are twenty large towns in Scotland, with a total population of 471,201, which have no pharmaceutical chemist; Greenock and Govan, each with a population of over 60,000, have none. The fair city of Perth, the capital of Scotland down to 1482, and Aberdeen are better; but the other cities, except Edinburgh, have a very small representation of pharmacists, and Glasgow presents an extraordinary contrast to Edinburgh in this respect.¹ There are seventeen of our pharmaceutical chemists in the Mauritius, and fifteen in the city of Melbourne, so that Glasgow is much worse off in higher pharmacy than these remote dependencies. What can be the reason of this? The answer is obvious. Pharmacy is at a low ebb here, because the work is done by the wrong class. It is estimated there are three hundred of these open doctor's shops in greater Glasgow. Now this may be justifiable in out-of-the-way country districts, but there can be no excuse for it, except use and wont, in the second city of the empire. Some of these shops have only lads and girls as assistants. Whether the law can put this sort of thing down entirely or not, I do not know, but it certainly ought to have that power. The three branches of the medical profession should be entirely distinct—the physician, the surgeon, and the pharmacist. The physician should prescribe the medicines, but not dispense them, and the pharmacist should dispense but not prescribe. This is the law in France, Germany, and other civilised nations, and it must eventually be the law here. At present over Great Britain the pharmacists do only a small portion of the dispensing, the bulk is done by those medical men who now represent the old apothecaries, the relics of a bygone age. A

¹ It will be seen that Edinburgh is better supplied than London; but there are 7 towns in Scotland better supplied than Edinburgh.

physician is not now a seller of physic, and a surgeon is not now a barber. Medical advice and payment for it does not now depend upon the quantity of medicine that can be poured into the patient, we all wish to take as little as possible. The surgeon does not sell his instruments nor does he make them, he only uses them—why should the physician do otherwise? That the recent prosecutions are approved by the Faculty of Physicians and Surgeons in Glasgow is shown by the following resolution recently passed by the Council:—

“The Council, in view of a recent discussion on the subject in the faculty that some fellows have their names appearing so prominently over or upon shop doors, or what appear to be shop doors, as to convey the impression that they ‘keep an open shop for the sale of drugs,’ and thus violate a regulation of the faculty, resolved that the special attention of the fellows should be called to the matter, and that they be requested to avoid everything which might have even the appearance of infringing this or any other of the regulations which they have undertaken loyally to obey.”

That this step was necessary the following advertisement taken from a Glasgow daily paper is convincing:—“To Druggists.—Wanted, young woman or youth to keep doctor’s shop for a week.”

Patents.—There are other chartered libertines who have long been disposing of poisons through proprietary medicines, the sort that “don’t contain no mercury and goes right to the spot;” so it does, for the spot is the extraordinary gullibility of the British public, who will swallow anything with an air of secrecy or mystery about it.

In Sir Kenelm Digby’s cephalic snuff, “composed of noble cephalic subjects which at once or at most with three times using it, with God’s blessing, cured the apoplexy,” and everything else has its counterpart still amongst us. Consul Denby says that 13,000 lbs. of tigers’ bones, valued at 3,000 dollars, were shipped from one port in China in 1889 for making a tonic medicine to give a tiger’s strength and fierceness to the Chinese buyers. Are we any better, and is there anything too ridiculous to attract by advertisement our “30 millions, mostly fools”? The fact is, they require to be saved from these things. In Bulgaria a wholesome law renders a proprietor of medicine advertised to cure a certain disease liable to imprisonment if it fails; and as many of ours are advertised to cure all diseases from a corn up to a consumption, it

would be easy to convict under this law. Even under our own law a lady has recently recovered £100 from certain advertisers for non-fulfilment of contract. Of course there are some good medicines among the patents, and these would always survive, but with many the following advertisement, cut from an Irish paper, is descriptive:—"Wanted.—A gentleman to undertake the sale of a patent medicine; the advertiser guarantees it will be profitable to the undertaker." Why should not these proprietary medicines be really patent or patented medicines; if they were, and the specifications filed in that receptacle of curiosities, the Patent Museum, it would be still more interestingly ridiculous. These licences realised last year £225,701, but that is nothing in our national revenue, and it had better be abolished altogether, for all the good or rather ill it does. We are told that one firm alone pays over £100,000 for advertisements, and it is said to be good for trade; or is it tirade? But there is another side to the question. According to Murrell 15,000 children are killed every year by soothing syrups. In 1890 there were 663 fatal cases of poisoning, and of these 149, or 22·4 per cent., were from opium in various forms. Chlorodyne counts for 11, and we owe to this the recent action taken by Government against the proprietors, and the legal decision that it can only be sold in future under poison restrictions, and by qualified men. Coroners have repeatedly called attention to the danger attending the sales of these articles, and we may hope now that such dangerous medicines will not find their way without a caution into the hands of the general public.

The *Lancet*, the *British Medical Journal*, and the daily press have applauded this decision, and I hope that now the Council of the Pharmaceutical Society know their strength, they will use it, mercifully of course, but firmly, as not for themselves but as a protection to the people.

Edinburgh.—I congratulate the pharmacists of Edinburgh that they do worthily represent Scotch pharmacy, and pharmaceutical education in a city noted for its noble university and its fine schools as a centre of medical and general education. While Glasgow is celebrated for the extent and variety of its larger chemical manufactures, Edinburgh is no less famed for its pharmaceutical specialities.

Edinburgh will always be renowned throughout the world as the birthplace of chloroform, and of all its honours we must give the palm to this; it would be impossible to estimate the amount

of human agony relieved, and the pain assuaged, or to over-estimate the vast debt which suffering humanity owes to the pharmacy of this city. But it is celebrated also for the manufacture of morphia, and salicin, and antiseptics, the Lister foundation of modern surgery, so common now that every soldier carries an antiseptic dressing in his knapsack, and if we add the many lives which this treatment has saved, it greatly increases the sick and wounded world's indebtedness. Gelatine also is a very large article of manufacture here. In special investigation from the University, I need only allude to the work of Professor Crum Brown on methyl and ethyl derivatives of strychnine and atropine, and his recent electrolytic synthesis of succinic, suberic, and sebacic acids. Edinburgh may also be proud of its great infirmary, its splendid museum and its free library, with its suggestive motto "Let there be light," and the Pharmaceutical Society may well be proud of the activity of pharmacy here. The evening meetings held last winter compare most favourably in interest and importance with those in London. The Assistants' Association, the members of which have so much assisted in the additions to the Pharmacopœia, and the Pharmacists' Athletic Club, are worthy of the highest praise; it is refreshing to hear that, notwithstanding their excellent scientific winter work, they held athletic sports last month, in which the usual competitions were fought and won, and to know that a golf club, with a gold medal for competition, has also been formed. I suggest, most respectfully, to the Assistants' Association to recommend to Dr. Attfield for his next report that the bicycle, golf club, cricket bat, and tennis racket should be added to the B.P. They might be placed among "the articles employed in chemical testing," *i.e.*, for the testing of chemists' chests; he will never get more valuable preventive medicines to include in that great work.

Botany.—In all pharmaceutical research the study of botany is necessary, so that the plant can be carefully selected before any investigation of its properties is made. There is no difficulty in studying botany here, as the lecture room and laboratories in the botanic gardens are most complete. Professor Balfour tells us there was a botanic garden here so early as 1670 for the cultivation of medicinal plants. Glasgow is not so well off, but the University are taking the matter up, I hope, in earnest, for there is much need for proper botanical class rooms, museums, and laboratories there. The world commenced with a garden, and we are led to expect that it will end with one, when the desert shall

blossom as the rose. We hear of artesian wells in the Sahara desert already rendering a part of it fertile, and, given a fertile soil, the air and the birds will plant it. It is not only the rose of Jericho (*Anastatica*) which blows about and grows everywhere. Sebastian found in the ruins of the Coliseum at Rome 260 species of plants brought there by birds. And Darwin grew 82 plants from a ball of clay in the foot of a partridge.

The sun never sets on the plantations of our mighty empire. Plants yielding fruit, flowers, and medicine grow for us all over it, and there is not a single hour, day or night, during the entire year when some of these are not ripening for our use. Fruit and perfume farms in Australia, for instance. On account of our great ocean commerce we ought to have the advantage in securing and bringing home the produce of other lands. Thanks to our swift steamers, fruits grow for us abroad better than at home, and this trade, though already large, is in its infancy. The value of fruit in diet is now better known; the grape, the orange, the apple, and of vegetables the tomato, the onion, and the celery, and many others, have their valuable properties. There is room for research in the juices of fruits. A recent investigation shows a digestive ferment, like papain, in pineapple juice, and it is probable that some such ferment is widely distributed in fruits. The study of the edible fungi would lead to an additional food supply almost entirely neglected, while that of microscopic fungi is becoming more interesting every day. The *Phytophthora infestans* causing the potato disease, and the *Oidium Tuckerii* which ravages the vineyards, and the numerous ergots which do so much damage to corn crops, and those which attack our fruit trees, are only instances which will repay investigation and may lead to important commercial results. The rise of the sap in high forest trees is a subject of which almost nothing is known. The formation of organic compounds in plants from inorganic is another tough subject. It has been pointed out that the necessary elements in plants have no higher equivalent than fifty-six. The cultivation of medicinal plants with the special view of increasing their active principles is capable of extension, and there are many fertile acres lying idle. Our own wild plants present an immense field for research; to even enumerate those common plants which have been employed in medicine from time immemorial would require a paper to itself. Many of these must possess valuable properties, and it is possible we may have too hastily thrown aside some of these in favour of other plants from abroad. Take, for instance,

an old remedy for dropsy, the lily of the valley; the examination of this plant has led to the discovery of convallarin and convallamarin, a valuable remedy for certain heart diseases. The examination of native herbs might be largely extended.

“No ear hath heard, no tongue can tell,
The virtues of the pimpernel.”

Is this only fancy, or may there not be some medical virtue intended? The Druids looked on the mistletoe and some other plants as sacred; is it not probable that the known medical properties of the plant gave it this position?

Waste weeds even may be valuable; as, for instance, Esparto grass for paper and the weed of the Bahamas for rope.

Pharmacy.—It is worthy of notice that tartaric acid and citric acid have both been synthesized. India-rubber and gutta-percha would appear difficult to make in the laboratory; but Professor Tilden, our first Bell scholar, has obtained the former from the isoprene of oil of turpentine by spontaneous polymerization. If something more difficult is wanted, there are ivory and whalebone wanting substitutes; these are getting dearer every day, every pound of ivory is said to cost a human life, and the small quantity of whalebone got this year fetched £3,000 per ton at Dundee.

As showing the rapid progress of organic chemistry, I notice in the *Journal of the Chemical Society* for July the following new alkaloids:—Aristolochin and Aristine from species of *Aristolochia*; Ephedrene from *Ephedra monastachia*; Pillijan, from *Lycopodium Saururus*; Glaucine from *Glaucum Luteum*; and Solidarin from *Lupinus albus*. This is pretty well for one month; I am sorry to add that all these discoveries are by foreign chemists. In the same journal there is a new sugar by Baeyer, he calls it the simplest sugar of the inositol group, he also calls it citransparadihydroxy-hexamethylene—but as that would be a difficult name to sell over the counter, the author has kindly contracted it to quinitol.

We have now a number of compressed gases which are chemical engineering conquests over great difficulties and very useful, such as carbonic acid, sulphurous acid, nitrous oxide, hydrogen, oxygen, and nitrogen, the latter has five per cent. of oxygen left in it and is offered as an anæsthetic. Even chlorine is now to be obtained in liquid form. Extracts of meat and malt, peptones, lanoline, vaseline, and cocaine for local anæsthesia are all of our period. Nickel and aluminium are two metals now easily accessible, and are both, and also aluminium bronze, likely to be useful in

pharmacy. The great number of colour indicators that have been added to litmus and turmeric for the estimation of various bases and acids give great facilities in testing; volumetric analysis is increasingly useful, and the standard work is still that of one of our founders, Sutton. The training of the pharmacist is particularly valuable for that of a general analyst, whereas the latter are not specially trained in materia medica, and the examination of medicines ought to be in the hands of a pharmacist.

Ptomaines. — There appears little doubt now that infectious diseases are the product of the ptomaines, resulting from the action of bacteria; these highly toxic alkaloids have been mistaken for other poisonous alkaloids in *post-mortem* examinations of human subjects where poisoning was suspected. In some criminal cases these have been mistaken for coniine, strychnine, delphine, and morphine, which they closely resemble in their reactions; others resemble nicotine, atropine, digitaline, veratrine, and curarine; it is obvious therefore that the *post-mortem* examination for poison presents hitherto unexpected difficulties. Many fatal cases of poisoning have also occurred from the presence of these ptomaines in meat, especially in pig meat, which bears out the value of the Mosaic restriction. The following toxic ptomaines have been isolated, and the formulæ are known—cadaverine, isoamylamine, neurine, choline, mytilotoxine, typhotoxine, tetanine, and mydatoxene. No doubt many more will yet be added to the list; but Professor Simon points out that the bacterial proteids, produced from the bacillus of cholera, typhoid fever, and diphtheria are even more poisonous and have yet to be isolated. Dr. Koch's tuberculin is also a poison of extraordinary virulence. When these bodies are known, the diseases may be conquered, by fighting the bacteria with their own products, thus adopting a new and true homœopathic treatment. The pharmacist will be called upon to isolate and prepare these bodies, and I hope he will also have a large share in the great work of their further investigation. It will call out the highest powers of research, but that ought not to deter him. The first chemical laboratory in London was that erected by the Pharmaceutical Society, and they are still to the front, having founded the first laboratory devoted entirely to original research in pharmacy. This laboratory has already produced some brilliant researches, and some of great practical value, though I hold that is not the first thing to aim at. The scientific side, not the commercial, must be taken up first. We want a diligent search for new truths, we are content to wait for their applica-

tion. The new title of Research Fellow will, I hope, attract many of the younger men. I would point out, too, that the British Pharmaceutical Conference possesses a research fund, and that we are glad to have demands made on it. There is an immense field for research in the extraordinary variety of natural products which, in daily increasing number, pass under the notice of the pharmacist; the book of Nature is always open to his study, and she brings her own reward.

Mr. Goschen, in his last budget, said that the profits of the cotton lords were not equal to those of the medical profession; the pharmacist may get his share some day, and the profits on pills will not always be reckoned as pillage.

In this purely commercial age it may seem quixotic to remark that money is not everything. Those of us who are not overstocked with it ought to be very thankful for the many good things that money will not buy. It cannot buy health and happiness, but it can and does often sell them. "Better is it to get wisdom than gold," said the king who had abundance of both. The world provides for the survival of the fittest, but who is to look after the maimed, the halt, and the blind? It is the honoured privilege of medicine to take care of the unfittest, the wounded, the weak, and the weary who drop out of the race, and restore them to their places in life.

The physician's remuneration does not begin and end with his fee; the thought of the conquest won by his knowledge, in the restoration of the sick patient to his family, after a long and anxious struggle with disease, must ever form the larger part of it. The same greater reward awaits the surgeon, when his skill enables him to restore some poor limping cripple to renewed activity. And has not the pharmacist his share in this better recompense when he discovers some valuable remedy, and contributes a new weapon to this noble fight?

Let me advise our young pharmacists to educate themselves to take their proper share in this great victory. If they are the least afraid that there may be any difficulty in finding a place for a well-educated man, let me remind them of the saying of a canny old Scotchman, so characteristic of his persevering race:—

"There's aye room at the tap."

Mr. R. REYNOLDS (Leeds) moved a hearty vote of thanks to the President for his able and eloquent address. He had been well

entitled to fill the post of President for twenty years past, but it was not to be regretted perhaps that his election had been deferred until the present year, since it had enabled him to give such a valuable and interesting *résumé* of the progress of technical chemistry, in which he stood *facile princeps*.

Mr. PETER BOA seconded the motion.

Mr. T. B. GROVES (senior Vice-President present), in putting the vote of thanks to the meeting, added a few words expressive of the great interest with which he had listened to the address, crammed full as it was of facts, wit, and wisdom.

The motion was carried by acclamation, and briefly acknowledged by the President.

REPORT OF THE UNOFFICIAL FORMULARY COMMITTEE.

The following report was read by Mr. Martindale:—

To the British Pharmaceutical Conference in Session.

Since the revision and publication of the Unofficial Formulary of 1891, in June last year, the Formulary Committee have had little material in the way of new formulæ to investigate, and as the publishers have a sufficient stock of the last edition in hand, the Committee does not recommend any further publication at the present time.

Criticisms, in the press as well as others sent privately, of some of the formulæ are having the consideration of the Committee. These principally have reference to the keeping properties of some of the preparations made according to the Formulary, so that, if re-appointed, the Committee have work in hand for the future.

WM. MARTINDALE, *Chairman of the Formulary Committee.*

The reading of papers was then proceeded with.

NOTES ON STARCH DIGESTION.

By G. A. GRIERSON, F.I.S.

Of late years the opinion appears to have been gradually gaining strength among the new school of medical men, that starches play an important part in the mixture of symptoms known as dyspepsia. Starch digestives have therefore become articles of

daily demand with the pharmacist. Chief among these have been malt and its extracts, the pancreas and its preparations. As malt extracts owe much, and pancreatic preparations most of their therapeutic value to the amount of starch-digesting ferment which they contain, it becomes increasingly important that we, as pharmacists, should be familiar with the conditions under which the preparations in question show their full activity and the most ready means of comparing their relative value. The following experiments have been performed from time to time during the last two years as the questions involved in them arose, and this must be my apology for their somewhat disconnected nature.

The Relative Digestibility of Different Starches.—Much confusion has arisen in the testing of malt and pancreatic preparations through different starches being used in the experiments. One gramme of each of the following starches and meals was boiled and made up to 100 c.c. with water. In each case the effect of 1 c.c. of pancreatic essence on the mucilage at 100° F. was noted, a dilute solution of iodine, placed in drops on a white slab, being used as an indicator.

Maize.—After digesting three hours with the pancreatic essence still gave a distinct blue with the indicator. Twenty hours' digestion appeared to have no further effect.

Wheat.—Distinct blue after two hours' digestion.

Rice.—Distinct blue after two hours' digestion.

Tapioca.—After half an hour's digestion gave only a faint green with the indicator.

Tous-le-Mois.—Ceased to give a blue in ten minutes.

Arrowroot (Bermuda).—Ceased to give a blue in ten minutes.

Arrowroot (St. Vincent).—Ceased to give a blue in ten minutes.

Potato.—Ceased to give a blue in ten minutes.

Oat-meal.—Gave a scarcely visible blue after digesting eighty minutes.

Wheat-Flour.—After two hours' digestion gave a very faint blue.

Potato Flour (2 grammes).—Ceased to give a blue in ten minutes.

Thinking that prolonged boiling might have some effect on the convertibility of starch, some experiments were instituted to test the point. Solutions of arrowroot and maize starches were brought to the boiling point in one case and in the other boiled for ten minutes. The time required for digestion was, in each case, the same, i.e., the arrowroot ceased to give a blue in ten minutes and

the maize still give a blue after three hours' digestion. These experiments were repeated with malt extract, and point to the following conclusions: — Tous-le-mois, arrowroot, and potato starches are the most readily converted into sugar by the amylolytic ferments. They are, therefore, the most suitable for testing malt and pancreatic preparations. This confirms the experiments of Cripps, recorded in the *Pharm. Journ.* [3], xx. 481. Tous-le-mois, arrowroot, and potato starches are the best for weak digestions. Chemically there seems to be no difference in digestibility between low-priced and high-priced arrowroots, nor between the latter and potato starch. Root starches are more digestible than seed starches. So long as starch granules are burst, further (limited) boiling does not render them more digestible. I use the word limited here because Mr. T. H. Melmore informs me that when wheaten flour is boiled for many hours it is much more readily digested by weakly children and has a more fattening effect than any other starchy food.

The Influence of Temperature on Starch Digestion.—To ascertain this, a mucilage of starch of the same strength as in the previous experiments was used and digested with 1 c.c. of pancreatic essence.

At 60° F.—Half an hour elapsed before the solution ceased to give a blue with the indicator.

At 100° F.—Conversion was complete in ten minutes.

At 140° F.—Fifteen minutes were required for conversion. As this appeared to conflict with the action of pepsin under similar conditions, its accuracy was doubted, and some further experiments were tried. They were all confirmatory.

At this point it was thought to be of interest to determine the action of the amylolytic ferment on unboiled starch. A solution was therefore made as before, but was not boiled. 100 c.c. were digested at 100° F. with 1 c.c. pancreatic essence. After some hours' digestion, the starch settled to the bottom of the flask, quite unacted on, and the supernatant liquid did not react with Fehling's solution. About 100° F. appears then to be the temperature at which starch digestion takes place most rapidly. High temperatures do not appear to have an accelerating action, as in the case of pepsin.

The Influence of Dilution on Starch Digestion.—Three mucilages of arrowroot were made, 1 gramme of arrowroot being used and made up to 50, 100, and 150 c.c. To each was added 1 c.c. pancreatic essence. The stronger mucilages digested rather more

rapidly than the weaker, showing that digestion is influenced either by the quantity of water present or by the degree of dilution of the pancreatic ferment. That the latter was in all probability the potent factor, was shown by some further experiments in which the quantity of pancreatic essence was varied. These showed that the rapidity of digestion was directly proportional to the amount of ferment present.

The Influence of Certain Chemicals on Starch Digestion was the next point which suggested itself as likely to throw some light on both pharmaceutical and physiological practice. A mucilage of arrowroot, strength 1 in 100, was digested as before, with 1 c.c. of pancreatic essence, at 100° F., but with the addition of 1 c.c. hydrochloric acid P.B. (as nearly as possible the proportion accepted as present in human gastric juice). After forty-eight hours' digestion the starch subsided, as if quite unacted on. The experiment was repeated, substituting saliva for pancreatic essence, with the same result. The same quantity of saliva, in the absence of hydrochloric acid, achieved the conversion of the starch in four minutes. These experiments prove conclusively that the digestion of starch cannot take place in the stomach, unless by the action of some ferment other than those of the saliva and the pancreatic juice. They also show it to be extremely probable that some forms of dyspepsia may simply be due to low alkalinity of the pancreatic juice, and its consequent inability to neutralise the acid contents of the stomach when they are emptied into the duodenum. It is, I believe, generally accepted that the presence of an alkali facilitates starch digestion. In order to test this point, an experiment similar to the last was tried, substituting 1 per cent. of sodium carbonate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) for the hydrochloric acid. After two hours' digestion conversion was still far from complete. The results noted above show that the presence of either acid or alkali, even in small proportion, completely stops the conversion of starch into sugar by the amylolytic ferments.

The Action of Alcohol on Starch Digestion.—This is a subject on which many random statements have been made. 100 c.c. of mucilage of arrowroot (1 in 100) was therefore digested at 100° F., as before, with 1 c.c. of pancreatic essence and 10 c.c. of Scotch whisky, the proportion which it was thought would represent the average present in the stomach after a glass of whisky. Digestion was complete in ten minutes, showing that alcohol in moderation has no retarding action on the digestion of starch by the pancreatic ferments. In the course of the experiments noted

above, it was noticed that there was considerable difference in the tints given by the same quantity of iodine with different starches. The following method was adopted, with the view of throwing some light on the reason for this.

Colours given by Different Starches with Iodine.—(1) 1 c.c. decinormal solution of iodine was made up to 100 c.c. with water. (2) .1 gramme of the starch to be tested was boiled with 10 c.c. of water. One c.c. of solution "1" was added to each test-tube containing the boiled mucilage of the starch to be examined. Arrowroot, potato, and tapioca gave a bright blue; rice gave a very faint blue; maize and wheat gave a faint violet. In the case of those which gave light colours, it was found that the colour could be deepened to that of the darker ones by the addition of more iodine. This points to the presence of a reducing body in those starches, such as rice, wheat, and maize (seed starches), which require larger quantities of iodine to produce a deep blue.

Mr. GERRARD said the paper was specially interesting to him, as he had been engaged for some time in experimenting on artificial digestion with the pancreatic ferment, though the material he had operated on was not starch, but meat. The paper, to a considerable extent, bore out his own conclusions, especially with reference to temperature. Mr. Grierson mentioned 100° F. as a satisfactory temperature for the digestion of starch, and 140° F. as being dangerous, if not fatal. He had frequently digested as much as 1 cwt. of lean meat with the pancreatic ferment, and he found the most satisfactory temperature was about 125° F. The influence of dilution on digestion was considerable, and in his experience with meat the greater the dilution, provided there were a certain percentage of pancreatic ferments present, the more rapid the digestion. It did not require anything like the three or four hours mentioned by most writers to digest meat with pancreatic ferments, and this was borne out by the paper, which showed that starch could be digested under favourable conditions in a few minutes. Starch could easily be broken up and divided, and so the ferment was brought well in contact with it. In the same way, if meat were finely divided, made into pulp, and brought in contact with pancreatic ferment well diluted, it was digested in from one to two hours, according to the character of the meat employed.

Mr. T. B. GROVES said it surprised him, as it probably had many others, to find that potato starch was put side by side with the

starch of the maranta. No doubt it digested in the same time, but it differed in other respects considerably. Some years ago, in experimenting on the keeping properties of starch jelly, it was found that that made from potato starch soon became liquid, whilst that made from maranta remained solid for a considerable time. Quite recently he saw an investigation as to the cause of the fact that in making brewer's wort from malt mixed with unmalted grain, the starch in the unmalted grain became digested; and it was discovered that there was a special ferment which attacked the cellular tissue surrounding the starch granule, because until that was removed the diastase proper had no action on the starch. It was well known that the action did take place, and this appeared to be the explanation.

Mr. DOTT said he thoroughly appreciated the importance of this paper, but it occurred to him that the test by iodine was not quite satisfactory in determining the extent to which digestion had taken place. He could imagine that a starch solution might not cease to give colour with iodine, and yet digestion might have gone on to the same extent as in another sample which gave no reaction. As long as a few particles of the starch remained unaltered, the colour would still be produced, although practically the whole of it might have been converted into sugar and dextrin. He thought, therefore, it would be well to adopt some other means of testing.

Mr. LLOYD WILLIAMS said the old-fashioned idea that the differences in colour observed while the process of digestion was going on were due to certain products of the reaction of diastase and starch known as erythro- and achroo-dextrins, was now found to be fallacious. Lintner found the changes were due to a new compound, called iso-maltose.

The PRESIDENT asked if Mr. Dott had any suggestion to make as to a better test for the amount of digestion obtained.

Mr. DOTT said he thought the simplest mode would be to estimate the amount of sugar formed.

Mr. GRIERSON, in reply, said the paper was only intended to be suggestive; none of his experiments were absolutely conclusive; and some points were well worth further examination. He thought he could corroborate what had been said by Mr. Gerrard as to the digestion of meat by pancreatic essence, and the importance of dilution; the more it was diluted the better it digested, either with pancreatin or pepsin, but with starch it seemed to be the reverse; though he was not yet prepared to state that as an

absolute fact. The point raised by Mr. Groves was very interesting; but with regard to Mr. Dott's suggestion, he might say that for pharmaceutical purposes the iodine test was near enough, and it was readily applied. His idea was to have a method which could be readily used, without any elaborate apparatus or great expenditure of time. Apart from that, he did not think an estimate of the amount of glucose formed afterwards was reliable. In the case of wheat and rice starch he did not think a complete conversion into sugar ever took place under artificial conditions; whereas in the case of potato and arrowroot it seemed that this did take place; at any rate, no trace of unaltered starch could be found.

A vote of thanks was passed to Mr. Grierson for his paper.

The next paper read was—

NOTES UPON THE ACTION OF THE ELECTRO-MAGNETIC CURRENT AS AN ANTIDOTE FOR STRYCHNIA POISONING.

BY JAMES MACKENZIE, F.S.A., EDINBURGH.

To possess a reliable antidote applicable in all cases of strychnia poisoning, must necessarily prove advantageous to every one engaged in pharmacy. The popularity of this valuable alkaloid, and its extensive use in dispensing at the present time, makes it all the more desirable that as much information as possible should be possessed by those engaged in the daily practice of pharmacy, and thereby enable them to render efficient service should occasion require.

As a rule, when a case of strychnia poisoning takes place, there is generally experienced by all concerned a feeling of utter helplessness, and any assistance that can be rendered in order to remove such a state of things can hardly fail to possess interest, even though the nature of this paper may not be strictly within the scope of this Conference.

My apology, therefore, for bringing this paper before you is the belief, that any additional information to that already possessed upon this subject, in order to try and save life, as well as to relieve the distressing effects which an overdose of strychnia is capable of producing, will doubtless be acceptable.

This subject had long occupied my thoughts, and in the mos

unexpected manner an opportunity was given me to test the ideas which had passed through my mind.

In the spring of 1870 my attention was drawn to the fact that a gentleman well known to me had a Dandy-Dinmont terrier dog which died immediately after giving it a pill the same as he was accustomed to take himself. The animal was not taking its food so well as usual, and he thought one of his pills could do no harm. They contained, with other ingredients, compound extract of colocyynth, and half a grain of the extract of *nux vomica* in each. Little notice was taken of this case at first, and another dog of the same breed was obtained. After a time it also had given to it one of the same pills, and within two hours or thereby it died. This led to a full consideration of the whole case, and it was admitted that the highly susceptible nature of the dog to the action of *nux vomica*, as recorded by the late Sir Robert Christison, M.D., had been the cause of death in both instances.

These cases had been the means of directing my attention specially to this subject.

Some months after this, another case of accidental poisoning took place. Strangely enough, the animal was a fine specimen of the same class of dog, but in this instance the poison was strychnia, and so far as could be determined, fully one grain of this alkaloid had been swallowed on a full meal. As the animal was at its master's side when the accident happened, no time was lost in bringing it to me, to see if anything could be done for it. By the time I saw it, the poison had begun to show the usual and unmistakable symptoms, in its having become rigid, while remarkable uneasiness was at once produced when the animal was handled or shaken. Its jaws were firmly closed, so that it was impossible to get it to swallow chloroform and some belladonna which at first I had thought to give it. In this condition the case seemed hopeless, when I suddenly recollected that the action of the electro-magnetic current might be worthy of a trial, though I had never known its application in a case of this kind. The beneficial effect was at once exhibited, for as soon as the poles were applied to the back of the neck and over the rump, the rigid condition gave place to a natural softness of the muscles, and a relief from the former pain or uneasiness; but the moment one of the poles was removed from its place upon the animal, the former condition was speedily apparent.

It now seemed to be a question of time: would the electro-magnetic current ultimately overcome the deadly effects of the

poison, or would the poison become master of the situation? No effort was spared to secure the former, and as time went on the symptoms became very hopeful, while the patient sufferer would look up, and in his own expressive way look his heartfelt thanks for what was being done for him. Thus was the time spent, and the encouragement given was such that at the end of four hours we had the satisfaction of seeing our little friend quite beyond the power of his adversary, and able to leap down from the table on which he had lain all this time. Before leaving I administered to him a dose of castor oil, and he followed his master a distance of two miles. I may remark that no bad effects remained, for he lived in the best of health for nearly ten years after, and during all this time, save for a month each year, he visited the shop at least once every week.

The first case of this kind was thus established, and in order to sustain it a series of experiments followed. Where under definite quantities of strychnia the same results were tried, in all circumstances likely to occur, such as given along with food, or upon an almost empty stomach, and also injected subcutaneously, in each case there was a complete recovery, and the dog saved from pain; indeed, when the trial was made in the evening, the animal had a more than ordinary appetite for his breakfast the following morning.

From the experiments thus made, many years ago, I think I am warranted to draw the following conclusions:—

1. That the immediate effect of the application of the electro-magnetic current is, that a sense of relief is produced, which is capable of overcoming the deadly effects of strychnia poisoning.

2. That as the dog is admitted to be particularly sensitive to the action of *nux vomica*, it is specially suited to draw the conclusion therefrom, that this treatment would be of great advantage to man under similar conditions.

3. That in the absence of a more reliable treatment it is worthy of further investigation.

Mr. MARTINDALE said there was a more convenient antidote in most pharmacies, and that was apomorphine, which could be administered as a hypodermic injection, and would have an emetic effect at once.

Mr. GERRARD said it was impracticable to give emetics in case of strychnia poisoning, even by injections, as a mere attempt to vomit brought on the tetanising effect of the poison. The only

way to empty the stomach in such cases was first to administer chloroform and then apply the stomach pump. He was much struck with the results narrated in the paper, seeing that the second dog which recovered took one grain of strychnine, which was more than equivalent to six grains of extract of nux vomica, whilst the first dog was killed with only half a grain of extract of nux vomica. Were both dogs of about the same size, because this was a very important point?

Mr. BIRD asked the strength of the current employed.

Mr. GROVES said some years ago he had a favourite dog which swallowed some mouse poison, and was speedily affected by spasms, but he restored him by repeated doses of chloral. He was very bad, but not so bad as to prevent administration of chloral by the mouth. There was no doubt that chloral would neutralise the action of strychnine unless the case were very severe.

Mr. ATKINS described a case of strychnine poisoning which came under his observation some years ago, in which the leading medical man was called in as speedily as possible and applied the galvanic current, but without avail. He (Mr. Atkins) remained with the man who had taken the poison until he died, and should never forget the terrific spasms which seized him. Had Mr. Mackenzie any knowledge whether electricity would prove effective after the poison had taken firm hold of the system?

Mr. MACKENZIE, in reply, said the dogs referred to were all of the same breed. The machine he used was a small hand machine about ten by forty-two inches, and the magnet was not very strong. The stronger the current was kept up, the better seemed the effect. He afterwards tried the same experiment on a larger animal, an Irish terrier, and the owner afterwards said that the dog had never been so well as he was after he underwent the treatment. His then assistant was a gentleman afterwards well known in London as a zealous anti-vivisectionist. The question in such cases was not what was the best thing to give, but how to give it. The jaw was so completely locked that nothing could be swallowed, and at that time the article mentioned by Mr. Martindale had not been invented, and it was quite true, as Mr. Gerrard had said, that the action of vomiting would be very detrimental to the patient. He hoped it would be long before any one present saw a case of strychnine poisoning, but if ever they did the circumstance would be indelibly photographed on their brain. He had written the paper from notes made at the time, mainly with

the view of putting an additional weapon into the hands of the pharmacist, if occasion should arise; of course the electrical machine for a human subject should be proportionately stronger.

Mr. Mackenzie was thanked for his paper.

The next paper read was—

NOTE ON THE PURITY OF COMMERCIAL SALTS OF LITHIUM.

By WILLIAM MAIR.

In accordance with a suggestion contained in the "Blue List," I have examined a few samples of commercial carbonate and citrate of lithium. They have been obtained in the ordinary course from manufacturing chemists and wholesale houses.

In the case of the carbonate, conversion into sulphate and subsequent examination yielded the following results:—

Description of Salt.	Yield of Sulphate from 1 g. (theoretical yield, 1.496 g.).	Impurity.	Quantity.
1. Fine White Powder	1.485 g.	—	—
2. Finely Granular „	1.460 g.	Sodium Carbonate	.95 per cent.
3. Fine White „	1.479 g.	—	—
4. Finely Granular „	1.448 g.	Sodium and Magnesium Carbonates	.2 per cent.
5. Finely Granular „	1.45 g.	Sodium Carbonate	Trace
6. Heavy White „	1.475 g.	Calcium Carbonate	Minute trace
7. Very fine White „	1.464 g.	Sodium Carbonate	.1 per cent.

The sulphating was carefully performed in a platinum crucible, and the estimations made by means of a fine laboratory balance. The calcium in No. 6 was present as the merest trace—which I did not consider it necessary to estimate, but which I took care to confirm—and may have been incidental to the process of manufacture. The alcohol and ether process of the United States Pharmacopœia was used for determining the amount of the sodium salt present. From these results I am led to conclude that commercial carbonate of lithium as now supplied is reasonably pure, and is free from actually added extraneous matter.

Examination of the citrate showed the following results:—

1. Fine White Powder Pure.
2. Finely Granular Powder . . . Sodium, trace.
3. In beautiful Prismatic Crystals . . Pure.
4. Granular Salt Sodium and Potassium, minute traces.
5. Crystalline Salt Sodium and Potassium, traces.
6. Granular Salt, slightly discoloured . Sodium, trace.
7. Fine White Powder Sodium, trace.

I have not found the B.P. method of conversion into carbonate so satisfactory as I could wish, although I have found the suggestion by Proctor useful, that of adding portions of yellow oxide of mercury to facilitate oxidation. The method of conversion into sulphate, the carbon being expelled as CO_2 , is more readily performed. The discoloration of No. 6 did not respond to any chemical test, and was probably due to the process of manufacture.

It will be noted that Nos. 1 and 3 in each case may be regarded as chemically pure; they are supplied by makers who have attained to some reputation for the production of really fine chemicals.

I have examined no sample of German origin.

The object of this note is chiefly to suggest that greater attention might be paid by our own manufacturers to the perfection of purity in pharmaceutical chemicals.

It is, perhaps, a fact which will be endorsed or corrected by those around me that our chemical laboratories have to depend on Germany for their supplies of absolutely pure chemicals.

Salts of excellent quality, and of a high degree of purity, are made by certain British houses, but it would be desirable that a higher general standard of purity could be obtained, and if the B.P.C. in its efforts "to maintain uncompromisingly the principle of purity" shall effect any measure of this, the suggestion may not be taken amiss.

Mr. DOTT said he had occasion from time to time to examine commercial carbonate of lithium, and never found it perfectly pure, though at the same time it might be considered of sufficient purity for pharmaceutical purposes.

Mr. THOMAS TYRER pointed out that according to the analyses given, broadly speaking, all the granular preparations were alkaline, and contained either sodium, potassium, or magnesium

carbonate. If this were so, it should lead them to reject, or view with suspicion, all granular preparations. Speaking as a manufacturer, he did not care how rigid the tests were made, for when it was impossible for an educated pharmacist to use inferior articles, competition would be reduced within the limits of common sense, and the best man would prove to be the fittest. At present they suffered from competition which certainly was not scientific.

A vote of thanks was passed to Mr. Mair.

The next paper read was on—

VALERIANATE OF ZINC.

By W. A. H. NAYLOR.

My object in communicating this note is to call attention to the quality of valerianate of zinc supplied by manufacturers for use in medicine. Samples were obtained from leading firms, and were marked either crystallized, B.P., or precipitated, the last two only being designated on order form. The samples, eight in all, including an experimental one (No. 5), made by me from stock articles by official process for the purpose of comparison, were examined as follows:—

(a) A weighed portion was ignited, moistened with nitric acid, dried, and again ignited, the residue being zinc oxide.

(b) A known quantity was distilled with sulphuric acid and water 1·2. The distillate was titrated with decinormal solution of caustic soda. The sulphuric acid which passed over was estimated as barium sulphate, and its caustic soda equivalent was deducted from the total alkali required for neutralization. The remaining soda was calculated into its equivalent of valerianic acid. $\text{Zn}(\text{C}_3\text{H}_5\text{O}_2)_2 \cdot \text{H}_2\text{O}$ is equivalent to 71·57 per cent. of valeric acid.

(c) The free acids obtained by distillation with diluted sulphuric acid were neutralized (or left faintly acid) with solution of barium hydrate. Any sulphate of barium was removed by filtration and the filtrate evaporated to dryness. Complete desiccation of the barium salt was effected by free exposure to a temperature of 130°C . until its weight remained constant. It was then moistened with sulphuric acid, ignited, and the resulting sulphate of barium weighed. Valerate of barium yields by this treatment 68·73 per

cent. of sulphate of barium. The following table represents the results obtained :—

	Zn O per cent.	H C ₂ H ₃ O ₃ p. c. by titration with Na HO Sol.	Ba So ₄ p. c.
1. Zinci Valer. cryst.	29.06	73.62	73.66
2. Zinci Valer., B.P., 1885 . . .	23.42	57.47	71.92
3. Zinci Valer., B.P., 1885 . . .	22.84	60.39	73.74
4. Zinci Valer., B.P., 1885 . . .	20.52	55.72	69.56
5. Zinci Valer.	26.79	62.00	68.25
6. Zinci Valer. precip.	49.08	43.71	74.53
7. Zinci Valer. precip.	64.51	18.24	—
8. Zinci Valer. precip.	62.97	59.30	84.00

The samples Nos. 1 to 5 were completely soluble in alcohol and contained traces only of sulphates. The distillates from sulphuric acid when dissolved in water gave, in every case, an immediate and considerable bluish-green precipitate on addition of acetate of copper. In No. 8 acetic acid was present in quantity; the rest, No. 5 excepted, exhibited mere traces. The acid distillate from No. 4 emitted a pronounced odour, recalling valerate of amyl.

The three samples labelled "Precipitated" were only partially dissolved by alcohol. The extent to which they were soluble was determined indirectly by treating them in the cold with alcohol to practical exhaustion, and in the case of two of them, drying the insoluble portions in air at the ordinary temperature. The insoluble residue from No. 7 amounted to 75.52 per cent., and from No. 8 to 54.29 per cent. To ascertain if these air-dry residues had a like composition, they were separately and successively desiccated over sulphuric acid, then moistened with nitric acid and ignited. No. 7 lost by desiccation 6.70 per cent., and left after ignition a residue of zinc oxide equivalent to 79.38 per cent. Similarly No. 8 lost 4.62 per cent., and gave 80.38 per cent. of zinc oxide. Evidently the insoluble portions approximated to identity of composition. Sample No. 8 gave a residue insoluble in absolute alcohol, which on ignition was equivalent to 31.02 per cent. of zinc oxide.

It has been pointed out by Mr. F. Sutton¹ that a weak solution of citric or tartaric acid dissolves valerianate of zinc without decomposition, and that it exerts no solvent action on zinc oxide. He recommends this simple test as a means of distinguishing the

¹ *Pharm. Journ.*, vol. 8 (2nd series), p. 134.

genuine from a fraudulent article. The Pharmacopœia requires valerianate of zinc to be soluble in alcohol, a requirement that excludes the "precipitated" from official recognition. The Pharmacopœia demand is more exacting than Mr. Sutton's test; for a 2 per cent. solution of citric acid will dissolve completely samples 6, 7, and 8 of the above table, their respective solubilities being in inverse proportion to their basicity.

As to physical characters, No. 1 only could be defined as being "in brilliant white pearly tabular crystals." No. 4 was in small soft pearly scales. Nos. 2 and 5 were in granular masses, unctuous to the touch. The same description applied to No. 3; it presented in addition a dirty white or greyish appearance. Of the "precipitated," No. 6 was in fine powder, and Nos. 7 and 8 consisted partly of powder and partly of small hard pieces. No. 7 was the densest, then followed No. 8 and No. 6.

From the results here tabulated the following inferences may be drawn:—

(a) That the valerianate of zinc used in medicine is not of uniform composition, and that it does not meet the requirements of the official tests.

(b) That the valerianic acid used in the manufacture of this salt is prepared from an imperfectly purified fusel oil.

Pure *Anhydrous* valerianate of zinc should yield on ignition 30.33 per cent. of zinc oxide, but since the salt in an anhydrous state is not obtainable by drying "on filtering paper at ordinary temperatures," it would be unfair to demand so high a percentage. Sample No. 5 shows what is practicable by the P.B. process from chemicals of commercial quality.

An amendment of the present test in the next revision of the Pharmacopœia, so as to specify the percentage of residue left on ignition after moistening with nitric acid, is eminently desirable, and I suggest 26 per cent. as a minimum. The United States Pharmacopœia demands 28.3 per cent. of zinc oxide.

The appeal to manufacturers to use, in the preparation of valerianate of zinc, a purer acid than at present will, I am convinced, be met either by a *non possumus* or a ready response.

The PRESIDENT said they were much indebted to Mr. Naylor for this paper. It seemed remarkable that while, according to the previous paper, salts of lithium should be so pure, those of valerianic acid should be so impure.

Mr. HODGKIN said there was no difficulty in making a proper valerianate of zinc, if people would pay the proper price for it; the cheaper the article the more zinc oxide it would be likely to contain. He should like to ask Mr. Naylor if he had isolated any of the three acids. If one made valerianic acid from fusel oil or ordinary amylic alcohol, there was a mixture of isomers; and it was possibly this which made it difficult to get a readily crystallizable salt. Had he identified the various acids which were obtained by distillation?

Mr. TYRER agreed with Mr. Hodgkin's remarks, but hoped no one would imagine that he or any manufacturer of character was prepared to sell valerianate of zinc or any other preparation of bad quality because he could not get a good price; for he was sure such an inference would be erroneous. Mr. Hodgkin had also referred to the extremely variable character of the fusel oil of commerce, and he took it Mr. Naylor referred to the well-known test for the butyl isomer, which was the constant accompanist of the fusel oil and valerianate of zinc of commerce. A reference to Atfield's work would show that in the manufacture of valerianic acid, the equivalent of valerianate of amyl was produced; and very probably some makers, who were not as scientific as they might be, used valerianic acid made by that process, and thus produced a valerianate of zinc of a very obnoxious character. The great objection to this article was its abominable smell, but when it was absolutely pure this was by no means so marked. The paper did good service in showing that the ordinary article was not up to the proper standard, and no doubt the origin of the evil lay in the fusel oil, an article which was now sold by every one who called himself a German agent. Only last week he had eight samples submitted to him from three different houses, not one of which was fit to be used as the basis of even commercial fusel oil. Of course the onus lay on the manufacturer to see that he got a fusel oil with such a proportion of amylic alcohol as would enable him to prepare valerianates with something like certainty. Mr. Sutton's test, to which reference was made, was absolutely valueless except for pure valerianate of zinc, and in all cases but one in which Mr. Sutton applied it, it was found to fail, undoubtedly owing to the cause mentioned. With regard to Nos. 6, 7, and 8, there was a similarity between these, and the varying viscosity of the oleates of zinc, in the preparation of which everything depended on the conditions.

Mr. MACKENZIE said the question might be viewed from the phar-

macist's point of view as well as the manufacturer's, and he would remark that this preparation used to be much more dispensed than it was now. The question arose, Was this because its therapeutic effects did not come up to what was expected? and that might be so to some extent; but there had of late been a number of other drugs put on the market for the same purpose. At the same time it was very important that all such articles when in the hands of the dispenser should be of such purity—quite apart from the question of price—as to answer the purpose the physician intended.

Mr. LLOYD WILLIAMS said he had considerable experience in fractionating the fusel oil of commerce, though not for the purpose now under discussion, and could testify to its extreme variability. That of German origin differed very materially from that produced as a bye-product in English distilleries.

Mr. ALFRED ALLEN said there was no need to go to Germany for fusel oil, it was produced by the ton every week in Edinburgh, and he had had personal experience of the difference in various samples. Some time ago he put himself through a course of fusel oil, putting a definite number of drops in each glass of whisky he took. It was all extremely nauseous, but there was a distinct difference observable in samples of different origin. Not only was there impure fusel oil, but there were four different kinds of amyl alcohol, which on oxidation produced eight different kinds of valerianic acid. It was no wonder, therefore, that there were variations in the valerianates of zinc, and the first thing to do would be to determine what it was that was really wanted.

Mr. PARRY said, according to a recent experience of his, it took about fourteen days in fractionating fusel oil before you could obtain pure amylic alcohol, the 90th fraction being the first which could be so described. The analysis seemed to show that there must have been in some samples a large quantity of foreign acid present, such as butyric. The various isomeric forms of valerianic acid would lead to no difference in the percentage composition of the salt.

Mr. MARTINDALE said he always preferred the crystalline form of the salt, the only impurity he found in it being water, from not being sufficiently dried.

Mr. T. B. GROVES asked if valerianate of zinc made from the natural acid was obtainable, or was it always made now by the oxidation of amylic alcohol? Would that made from the natural acid be in any way superior?

Mr. HODGKIN said the natural acid could be obtained at times,

but last autumn there was none to be got, the last year's crop of valerian being very short, and the new one not having come in. Sometimes you could get none for months at a time; when you could it was very pure as compared with that made artificially.

Mr. NAYLOR said his point was this. The pharmacist ordered "zinci valer., B.P.," and got an article from the manufacturers so labelled, but which not only did not answer the official tests, but was very far from doing so. He fully sympathised with what had been said about the difficulties of the manufacturers in obtaining a body of uniform composition, but he hoped they would be able to agree on essential points, and that notwithstanding the difficulty they would obtain a valerianate of zinc of such a purity as would yield a certain percentage of oxide of zinc. He had named in the paper 26 per cent., and he thought some such test might be introduced and something like uniformity secured.

The next paper read was—

CARBO ANIMALIS PURIFICATUS, P.B.

By JOHN HODGKIN, F.L.S., F.I.C., F.C.S.

My attention was some time ago directed to this in consequence of inquiry for purified animal charcoal guaranteed to answer the B.P. requirements. Accordingly, I made an examination of some that I believed to answer the B.P. tests, but was much surprised to find that the ash left on ignition was far above the B.P. requirements. I have now collected a certain amount of information on this subject, which I think may perhaps be of sufficient interest to lay before this Conference.

The details as given in the Pharmacopœia are as follows:—

"*Carbo animalis purificatus*.—Purified animal charcoal.

"Animal charcoal from which the earthy salts have been almost wholly removed. Product about 10 per cent.

"Take of—

Bone-black, in powder	. . .	16 ozs.
Hydrochloric Acid	. . .	10 fluid ozs.
Distilled Water	. . .	a sufficiency.

"Mix the hydrochloric acid with a pint of the water, and add the bone-black, stirring occasionally. Digest at a moderate temperature for two days, agitating from time to time; collect the

undissolved charcoal on a calico filter, and wash with distilled water until what passes through gives scarcely any precipitate with nitrate of silver. Dry the charcoal, and then heat it to redness in a closely covered crucible.

“Characters and Tests.”—A black, pulverulent substance, inodorous and almost tasteless: 10 or 12 grains well shaken with 1 oz. of water, containing about a fluid drachm of ‘solution of litmus,’ removes the dissolved colouring-matter; the mixture when thrown upon a filter passing through colourless. When burned at a high temperature, with a little red oxide of mercury and free access of air, it leaves not more than about 2 per cent. of residue.

*“Dose”—*20 to 60 grains.”

I have accordingly made a series of experiments, preparing *carbo animalis purificatus* by the process adopted by the B.P. and other Pharmacopœias. The bone-black that I started with was of the following composition:—

Water	7.773
Ash	76.647
Carbon (by difference)	15.580
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	100.000

—equivalent to 83.107 per cent. ash, and 16.893 per cent. carbon on the anhydrous substance. The ash consisted of—

F ₂ O ₃	1.80
Al ₂ O ₃	0.95
CaO	51.73
MgO	trace
SiO ₂	2.86
Cl	0.59
SO ₃	1.21
CO ₂	1.41
P ₂ O ₅	38.86
Fl.	trace
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	99.41

that is to say, principally of lime and phosphoric acid. This was treated by the Pharmacopœia process, using the exact quantities, with the following result:—

Water	00.146
Ash	77.042
Carbon	22.812
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	100.000

—equal to 77.155 per cent. ash and 22.845 per cent. carbon on the anhydrous substance. The composition of the ash has now altered as follows:—

	Original Charcoal.	B.P.
Fe ₂ O ₃	1.80	1.51
Al ₂ O ₃	0.95	1.20
Ca O	51.73	45.33
Mg O	trace	—
Si O ₂	2.86	3.81
Cl	0.59	—
SO ₃	1.21	1.06
C O ₂	1.41	—
P ₂ O ₅	38.86	46.46
Fl	trace	—
	99.41	99.37

showing that the net result of the process had been to remove a small quantity of lime and a little iron. The yield of 10 lbs. of charcoal treated by the B.P. process, I may mention, was 6 lbs. 1½ oz., or a yield of nearly 61 per cent., against the B.P. yield of “about 10 per cent.”

This is a fair example of the value of the B.P. process. I have had several experiments made strictly in accordance with the B.P. instructions, and the results are practically uniform.

The French Codex (1884) directs that 1 kilo. of charcoal should be mixed with 4 kilos. distilled water, and that 1 kilo. hydrochloric acid should be gradually added, constantly stirring, and that the material should be left in contact for twelve hours, agitating from time to time. It is then to be washed until free from acid and indifferent to nitrate of silver; it is then filtered and dried at about 150° C., sifted through a fine sieve, and preserved in stoppered bottles. No test is given.

The result of this process is as follows:—

Water	1 976
Ash	56.612
Carbon	41.412
	100.000

—equal to ash 57.76 and carbon 42.24 per cent. on the anhydrous substance. The increase of hydrochloric acid has reduced the

percentage of ash considerably as compared with the B.P. The composition of the ash has now become as follows :—

	Original Charcoal.	Codex.
Fe_2O_3	1.80	2.97
Al_2O_3	0.95	0.95
CaO	51.73	47.20
MgO	trace	—
SiO_2	2.86	10.71
Cl	0.59	—
SO_3	1.21	1.18
CO_2	1.11	—
P_2O_5	38.86	36.33
Fl	trace	—
	99.41	99.64

A considerable increase is now noticed to be taking place in the percentage of the silica and iron. A reduction, however, has taken place in the percentage of the phosphoric acid.

As no requirements are given as to the percentage of ash or carbon, the French Codex is in a strong position as compared with the B.P.

The United States Pharmacopœia (6th Decennial Revision, 1883) gives the following process :—

“*Carbo animalis purificatus*.—Purified animal charcoal.

Animal Charcoal, in No. 60 powder	2 parts.
Hydrochloric Acid	3 „
Water	a sufficiency.

“Pour the hydrochloric acid, previously mixed with 15 parts of water, upon the animal charcoal, and digest the mixture on a water-bath for twenty-four hours, occasionally stirring. Pour off the supernatant liquid and digest the undissolved portion with 15 parts of water for two hours. Transfer the mixture to a strainer, and, when the liquid portion has run off, wash the residue with water until the washings cease to be affected by test-solution of nitrate of silver. Dry the product, heat it to dull redness in a closely covered crucible, and, when cool, keep it in well-stoppered bottles.

“A dull, black powder, odourless and tasteless, and insoluble in water, alcohol, or other solvents. When ignited at a high tem-

perature with a little red oxide of mercury and with free access of air, it leaves at most only a trace of residue. If 1 part be digested with 2 parts of hydrochloric acid and 6 parts of water, the filtrate, after being supersaturated with water of ammonia, should remain unaffected by test-solution of magnesium (absence of phosphate)."

It should be mentioned that the U.S.P. *carbo animalis* is required to give an ash of at least 86 per cent. of the original weight (leaving only 14 per cent. for water and carbon), which should be completely soluble in hydrochloric acid, with the aid of heat. How far the U.S.P. process answers is best seen by the following analysis of a sample prepared strictly in accordance with these instructions:—

Water	00·841
Ash	16·088
Carbon	83·071
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	100·000

—equal to ash 16·12 and charcoal 83·88 per cent. on the anhydrous substance—a most marked improvement and advance on the English and French processes, but still not coming anywhere near their own specified requirements. The ash now consists of:—

	Original.	U.S.P.
Fe ₂ O ₃	1·80	11·88
Al ₂ O ₃	0·95	5·62
Ca O	51·73	9·33
Mg O	trace	—
Si O ₂	2·86	59·00
Cl	0·59	—
S O ₃	1·21	2·14
C O ₂	1·41	—
P ₂ O ₅	38·86	11·43
Fl	trace	—
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	99·41	99·40

A great reduction both in lime and phosphoric acid has now taken place; whilst the iron, alumina, and silica are steadily increasing. The "*Pharmacopœia Germanica I.*," 1872, simply included *carbo animalis*, and gave no directions for making *carbo animalis purificatus*, which has not appeared in any of the subsequent editions; indeed, even *carbo animalis* was dropped in the 2nd and 3rd *Pharmacopœias*; the compilers evidently realizing the difficulties

connected with the subject. The Italian Pharmacopœia, Rome, 1892, uses—

Animal Charcoal.	6 parts.
Concentrated Hydrochloric Acid (s.g. 1.18)	5 „
Water	100 „

The process is to mix the charcoal with the acid, diluted with 5 per cent. water. After standing for twenty-four hours the remainder of the water is added, then agitate several times and boil up and collect on a filter, wash, etc., in the usual way. Then follows the important remark, "If a purer quality is desired, repeat the treatment indicated," the compilers evidently being well aware that the initial purification does not give a pure article. No details as to percentage of ash and carbon are given. I have not made a sample by this method, which I have only mentioned on account of the remark as to the second treatment, which is of great service.

These results may be taken to represent the methods that each pharmacopœial authority considered the best, and, as the analyses show, not one of them can be held to give a pure or really satisfactory article. The authorities have evidently been under the impression that animal charcoal consisted of carbon and calcium phosphate and infinitesimal quantities of other substances, whereas there are present substances, such as phosphates of iron and alumina, which, after the carbonization of the bones, become soluble with very great difficulty, and are not easily removed; and also silica and a certain amount of calcium sulphate. The processes may be summarized as follows:—

	B.P.	Codex.	U.S.P.
Animal Charcoal.	16 oz.	16 oz.	16 oz.
Acid, Hydrochloric	11½ „	16 „	24 „
Length of maceration	48 hrs.	12 hrs.	24 hrs.
Temperature employed	"moderate"	cold	water-bath
Anhydrous result:—			
Ash	77.16	57.76	16.12
Carbon	22.84	42.24	83.88

These results show that the B.P. process is (1) deficient in acid, and (2) the temperature used is not high enough. This is evident on comparing the B.P. with the Codex and the U.S.P. results. It now became a matter of interest to examine commercial samples of B.P. carbo animalis purificatus and to see what was being sold

under this name. I procured the following five samples through ordinary trade channels. The analyses were as follows:—

	A	B	C	D	E
Water	17.64	50.44	4.70	5.19	4.01
Ash	16.45	10.00	80.28	73.57	72.67
Carbon	65.91	39.56	15.02	21.24	23.32

equal to—

	A	B	C	D	E
Ash	19.98	20.18	81.21	77.59	75.70
Carbon	80.02	79.82	15.76	22.41	24.30

on the anhydrous substance.

The ash analysed as follows:—

	A	B	C	D	E
Fe ₂ O ₃	4.87	10.21	2.14	2.02	1.80
Al ₂ O ₃	0.51	2.73	0.84	1.07	1.19
CaO	6.38	4.68	53.60	52.67	48.67
MgO	1.02	—	—	—	—
SiO ₂	79.80	73.63	3.55	4.48	6.48
Cl	—	—	1.00	0.50	—
SO ₃	2.81	0.66	—	1.64	—
CO ₂	—	—	2.29	1.22	—
P ₂ O ₅	2.87	7.44	36.89	36.38	40.93
Fl	—	—	—	trace	—
	98.26	99.35	99.71	99.98	99.07

It will be seen that A and B differ very considerably from C, D, and E; in fact, it is evident that they are animal charcoal, which has been treated with acid and a certain percentage of the soluble constituents removed, the high percentage of silica in the ash clearly indicating this. A has evidently been washed with a water containing calcium sulphate in solution. The very high percentage of water in B is worthy of notice; of course, this apparently reduces the percentage of the ash; and as new charcoal will absorb from 80 to 100 per cent. of its own weight of water, this is an easy method of superficial purification.

C, D, and E seem to be simply ordinary animal charcoal that has been dried, so as to lose a portion of the water; in fact, they are good commercial animal charcoal, but certainly not the B.P. "purificatus."

The results are excessively surprising, and should put the users of this article on their guard. It is, I believe, practically impossible to make an article that will meet the B.P. requirements, except at a fabulous cost; but it is not difficult to turn out a good article at a moderate price. The best method that I have found to make a good purified animal charcoal is as follows:— Boil the charcoal for some hours with twice its weight of hydrochloric acid and twice its weight of water; filter from the acid solution, and boil up again with half the above quantities of acid and water. Wash free from acid and soluble salts; dry, etc., as usual. Such a treatment gave the following results (the product was not heated in a covered crucible, but simply stove-dried):—

	Per cent.
Water	7·847
Ash	13·871
Carbon	78·282

equal to—

Ash	15·05
Carbon	81·95

on the anhydrous substance.

The ash analysed as follows:—

Fe ₂ O ₃	5·21
Al ₂ O ₃	1·20
CaO	22·10
MgO	—
SiO ₂	51·81
Cl	—
SO ₃	8·51
CO ₂	—
P ₂ O ₅	13·11
Fl	—
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	90·94

This is a better charcoal than any of the others, the U.S.P. coming nearest to it. In order to make a full comparison, the decolorising power of each sample was tried. A standard solution of caramel was made containing 0·05 gramme per litre. Two

grammes of charcoal were added to 400 c.c. of such standard solution, and the percentage of colour removed was determined.

The results were as follows:—

	Per cent.
Commercial Animal Charcoal	79.95
B.P.	38.27
Codex	63.19
U.S.P.	48.05
A	62.54
B	60.88
C	67.42
D	65.01
E	50.73
F	86.76

so that this last sample, prepared by the mode I have indicated, comes out best in every way. It has been frequently stated that the decolorising power of animal charcoal is due in a great measure to the calcium phosphate it contains. The decolorising power of this was determined in the same manner with phosphate prepared according to the B.P. directions, and dried at a temperature not exceeding 100° C. The percentage of colour removed was 32.65, whilst if the phosphate was heated in a crucible (as the charcoal is directed to be done) the percentage removed is only 1.33.

In conclusion, I would recommend the adoption of some such process as I have indicated, taking care to use sufficient acid, and to boil well together in the water-bath or otherwise, so as to effect as large a removal of the calcium phosphate and other bodies soluble in hydrochloric acid as possible; that the finished product should not contain more than 8 per cent. of water (drying in a crucible evidently not being necessary), nor more than about 15 per cent. of ash, and containing 75 to 78 per cent. available charcoal. If prepared according to these directions, and meeting these requirements, it will have a high decolorising power. It is possible to make a charcoal with a still lower percentage of ash, even down to below 4 per cent., but the treatment involved diminishes very considerably the decolorising power, and adds enormously to the cost without any compensating advantages. As far as I know—and my experiments confirm my views—it is absolutely impossible to make such charcoal as the B.P. requires, and it therefore seems reasonable to substitute for the theoretical ideal an article that can easily be made and gives every satisfaction in practice.

TABLE OF RESULTS.

	On anhydrous substance.		Percentage Composition of the Ash obtained on Calcination.											Decolorising power.
	Ash.	Carbon.	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	SiO ₂	Cl	SO ₂	CO ₂	P ₂ O ₅	F.	Total.	
Commercial bone-black														
B.P. 1885	7-77	76-65	15-58											79-95
U.S.P., 6th Decen. Rev. 1883	0-15	77-04	22-81	1-80	51-73	trace	2-86	0-59	1-21	1-41	38-86	tr.	99-41	38-27
Commercial samples of "carbo animalis purif. B.P." :-	1-98	56-61	41-41	1-51	45-33	—	3-81	—	1-06	—	46-46	—	99-37	63-19
A	0-84	16-09	83-07	2-97	47-20	—	10-71	—	1-48	—	36-33	—	99-04	48-03
B				0-95	51-73	—	2-86	—	1-21	—	38-86	—	99-41	
C				1-51	45-33	—	3-81	—	1-06	—	46-46	—	99-37	
D				2-97	47-20	—	10-71	—	1-48	—	36-33	—	99-04	
E				11-88	9-33	—	59-00	—	2-14	—	11-43	—	99-40	
F (Special method)														
A	17-54	16-45	65-91	4-87	6-38	1-02	79-80	—	2-81	—	2-87	—	98-26	62-54
B	50-44	10-00	39-56	10-21	2-73	—	73-63	—	0-66	—	7-44	—	99-25	69-88
C	4-70	80-38	15-02	2-14	6-84	—	3-55	1-00	—	2-29	36-39	tr.	99-71	67-42
D	5-19	73-57	21-24	2-02	1-07	—	4-48	0-50	1-64	1-22	36-38	—	99-98	66-01
E	4-01	72-67	23-32	1-80	1-19	—	6-48	—	—	—	40-93	—	99-07	50-73
F (Special method)	7-85	13-87	78-28	5-21	22-10	—	54-81	—	3-51	—	13-11	—	99-94	86-76
Calcis Phosphas B.P. dried below 100° C.														32-65
Ditto, after ignition														1-33

NOTE.—The decolorising power of the charcoal (without previous drying) is expressed in percentage of colour removed from a standard caramel solution (=100 per cent.).

The PRESIDENT said no one who had had any experience in the purification of animal charcoal would be surprised at the result of this paper. He looked on absolute purification as practically impossible, and the question really was how far it was worth while to carry it. Even in the process described, the ash was still 14 per cent., which was very high for a charcoal. He was rather surprised to find such a high degree of decolorising power where so much of the inorganic material had been removed, because the usual experience was that the more of the mineral matter removed the worse the charcoal became as a decoloriser, and Mr. Hodgkin appeared to have found the same thing when he carried it beyond a certain point; his own experience, however, was that the process of deterioration began at a much earlier stage. What the actual decolorising agent in animal charcoal was, he did not think any one knew. Many other substances had a much greater effect, but they could not be used unless they were sold very cheap, because the sugar refiner got the use of his charcoal for the small margin of difference between the price he paid for it and what he sold it for again as a manure. Probably he got the use of a ton of charcoal for £2 or £3.

Mr. DOTT said he could confirm most of the statements in the paper, though he had never gone into the subject in so complete and analytical a way. It was evident that the B.P. process did not give anything like pure animal charcoal. They did not require an article perfectly free from ash, but one sufficiently free from phosphate of lime particularly to be suitable for the purification of alkaloids and such things for which it was chiefly used. When working with an acid solution, if there were any phosphate of lime, it would dissolve out. Whether the presence of phosphate of lime added to the decolorising power or not, must depend very largely on the colouring matter which it was desired to remove; for many purposes it would be no advantage, but quite the contrary, and the more the charcoal was extracted free from mineral matter the greater its decolorising power compared to the original weight of charcoal from which it was obtained, though that was contrary to the statements in some books.

The PRESIDENT said that scarcely tallied with the fact that the charcoal in a sugar refinery was treated over and over again until the 15 per cent. was reduced to 8 per cent. or even less, when it looked quite grey, and yet it was a better decoloriser than ever.

Mr. DOTT quite agreed that for sugar-refining purposes the mineral matter might not be a disadvantage, but it certainly was

in the case of some things in his own experience. The chemist in one sugar refinery told him that when the charcoal got into a very fine state of division it ceased to be of any value for their purposes.

Mr. CONROY said he was interested in this paper, because eighteen months or two years ago he went over part of the ground, and in the main came to the same results; although he did not work them out so accurately. The proportions of acid and water which gave the best result—he could not get anything like the B.P. purity—were three parts of acid and three of water to one of charcoal with double treatment. This yielded a charcoal with 16 per cent. of ash. He found that freshly precipitated phosphate of lime had considerable decolorising properties; and, in his opinion, it was even superior to the purified charcoal of the B.P. When he wanted to decolorise an article he always used crude charcoal, and found it gave the best results.

The PRESIDENT suggested that the same remark would apply to hydrate of alumina, precipitated.

Mr. TYRER said he could confirm in the main the results Mr. Hodgkin had so clearly put forward. There had always been a difference of opinion as to whether the decolorising effect was due to the carbon of the charcoal, or to the phosphates, which, owing to their peculiar mechanical condition, were so intimately mixed with it. Within the last eighteen months he had had inquiries for animal charcoal, B.P., 1867, and animal charcoal, 1885; but after studying very carefully the definitions in the two Pharmacopœias, he could not see practically any difference. Why gentlemen asked for one particular kind he did not know, but he told them plainly there was no such thing as the 1867, and no difference between the 1867 and the 1885. He should be glad if they would define what they did want, and then he would do his best to supply it; but the difficulty of supplying an article as defined in the B.P. 1885 was very great; it was almost impossible, if not quite so. He hoped the compilers of future Pharmacopœias would bear in mind this question of definition. Mr. Hodgkin emphasized the importance of the added quantity, the high temperature, and of not doing it in a slovenly way. After the first digestion the mass was filtered and then digested again—that was the essence of the process. Supposing two digestions took place, and the deposition occurred after proper digestion, then a new quantity of acid was added, the same result did not follow, curious as it might appear. With regard to the decolorising power, he

should await Mr. Hodgkin's paper elsewhere with interest, but he had learned that the question of decolorising from standards of saccharine fluids had given way in the case of animal charcoal to a process of decolorising a solution of rose-aniline, and he believed a communication would soon be published in which something like an authoritative standard of the decolorising power of charcoal in various stages of age would be included. It was exceedingly difficult to determine this power in the case of saccharine fluids. So far as regarded the use of animal charcoal in ordinary pharmaceutical work, it was a question of the degree of the acidity of the solution with which one was dealing. Remembering that the phosphates in the charcoal were in the insoluble condition, it would appear that the minimum of harm would result. He hoped that in the future Pharmacopœia the definition would be more explicit, and on this point he would direct attention to the Italian Pharmacopœia just published.

Mr. PETER MACKWAN said there was one instance which showed that burnt sugar was probably not the best test which might be selected. Some eight or nine years ago, Dr. Inglis Clark showed in Edinburgh that in the case of ordinary ginger ale, which was coloured with burnt sugar and bottled in syphons, when it was withdrawn all the colouring matter came to the top.

The PRESIDENT said indigo was often used as a test, but it was another of the difficulties of the question that it was very problematical whether one charcoal would have the same decolorising power with indigo as it had with burnt sugar.

Mr. MARTINDALE was surprised to find there should be such a large quantity of ash still remaining. This substance was not supposed to be pure but purified animal charcoal, but he did not expect to find it so impure as had been shown. It had this importance, that when it was used for decolorising solutions of salts, such as citrate of potassium, which were apt to get a little coloured before they were evaporated down to dryness, these solutions dissolved the calcium phosphate of the charcoal, and on redissolving the salts they formed opalescent solutions, by depositing the lime salt again. He had been told by manufacturers that it was impossible to get animal charcoal which would decolorise this salt in a satisfactory manner.

Mr. BIRD said the chief difficulty he had met with in the employment of animal charcoal as a decolorising agent was due to the soluble iron it contained—soluble, he meant, in such liquids as citrate of ammonium or acetate of amyl. In such cases the colour

was not removed, but a yellow tint was communicated to the liquid. He was only able to succeed by using a very pure animal charcoal costing 3s. or 4s. per lb. He should like to hear Mr. Hodgkin's views as to how the iron, which had resisted treatment with acid, became soluble—was it due, for example, to the use of impure hydrochloric acid in the manufacture?

Mr. Moss said he supposed Mr. Hodgkin's idea in carrying out this research was to try and bring the Pharmacopœia into line with what was practicable and reasonable. He was quite unable by following the Pharmacopœia directions to produce a body answering the tests given. He always found it necessary to use more hydrochloric acid than was ordered, and did not find it needful to employ a higher temperature than that of an ordinary hot room. He hoped the compilers of the Pharmacopœia would take note of these facts.

Mr. HODGKIN, in reply, dealing with several questions as to the solubility of iron salts, said that the iron salts, whether existing as silicates or phosphates, having been ignited, were practically insoluble in hydrochloric and other mineral acids, but were affected by organic acids, lactic acid especially having such a solvent effect. But the cost of purifying by means of lactic acid would, of course, be prohibitive. Instead of the quantities mentioned by Mr. Conroy, he used 2 parts of acid and 4 of water for the first exhaustion, and half those quantities the second time. Mr. Conroy found an ash of about 16 per cent., but he did not state whether that was on the anhydrous or hydrated sample. As his experiments showed an ash not exceeding 15 per cent., he thought it as well to save half the acid and half the water. With regard to the decolorising power of the charcoal, this was tested on a standard solution of caramel containing .005 gramme per litre. A convenient proportion was two grammes of charcoal to 400 c.c. solution. The B.P. directed you to use litmus, but that was a very unreliable test. The quality of litmus was very variable, and no definite result could be obtained. He tried several experiments with indigo, and found the action most uncertain. You might divide 50 grammes of charcoal into two parts and find different results. He therefore took caramel as being a solution easily made, and which worked well. The chief point he wished to bring out was that the B.P. process was absolutely impossible. He did not believe you could make animal charcoal that would answer the tests; and if you did, it would not be worth anything. He had had a sample containing 3 or 4 per cent. of

ash, and found its decolorising power was very low; about 30 as compared with over 80.

The PRESIDENT proposed a vote of thanks to the author of this paper, which was carried unanimously.

The next paper read was—

STRYCHNINE SALTS.

By D. B. DOTT, F.R.S.E.

Although the alkaloid strychnine has been known for a long time, the published information regarding its salts is rather meagre, and in some particulars inaccurate. At one of the evening meetings of the Pharmaceutical Society held in Edinburgh, Mr. G. Coull contributed a note on *strychnine acid sulphate*, showing that its solubility in water is only about 1 in 50, that it forms a very acid solution, and apparently suffers a certain amount of decomposition when dissolved in water; indeed, so far from being (as has been stated) pre-eminently adapted for hypodermic use, the acid sulphate is to be regarded as distinctly unsuitable for that purpose. I was able to confirm these conclusions, and suggested that the neutral tartrate might be found more suitable. Since then I have carried out a number of experiments on the strychnine salts, and though I have not had time to completely investigate the subject, the results are sufficiently conclusive on some important points.

The neutral tartrate $B_2C_4H_6O_6$ is everything that could be desired as regards neutrality, but its solubility is little if at all better than that of the acid sulphate. A solution prepared by warming, and allowing the salt to crystallise out, retained at $60^\circ F.$ 1 part in 47 parts water. A solution made by digesting excess of the salt in water at $60^\circ F.$ for several hours gave a solubility of 1 part in 52. I have noticed two published statements as to the water of hydration of the neutral tartrate, one giving 4 molecules, the other 7. Both these statements appear to be erroneous. The salt crystallised from water, and dried first on blotting-paper and then by exposure to the air (in one case for several days), lost in the water-bath 13.77 per cent. Another crystallisation gave 13.79. The maximum loss of 14.23 per cent. was obtained by drying in an air-bath at $105^\circ C.$ As $B_2C_4H_6O_6$,

$7\frac{1}{2}$ H_2O = 13.75 per cent. H_2O , and $\text{B}_2\text{C}_4\text{H}_6\text{O}_6$, $7\frac{1}{2}$ H_2O = 14.16 per cent. H_2O , the probability is that the composition of the crystallised neutral tartrate is represented by the formula $(\text{B}_2\text{C}_4\text{H}_6\text{O}_6)_2 \cdot 15 \text{H}_2\text{O}$.

The tribasic citrate is not readily formed, if indeed it can be formed at all. The dibasic citrate, when crystallised from water and dried in the usual way, lost 10.38 per cent. under 100°C . When exposed to a higher temperature in air-bath the loss indicated 11.37 per cent., but the salt had become coloured as if from slight decomposition. From these results the composition is probably represented by $\text{B}_2\text{C}_6\text{H}_8\text{O}_7 \cdot 6 \text{H}_2\text{O}$. The solubility in water was found to be 1 part in 37.

The hydrochloride of strychnine forms well-defined crystals which dissolve to a neutral solution in water; .373 gramme of the air-dry salt lost at 100°C . .0245 gramme = 6.56 per cent. There was no further loss of weight at 120° . As B H Cl , $1\frac{1}{2}$ H_2O = 6.54 per cent. water, the formula may be given as $(\text{B H Cl})_2 \cdot 3 \text{H}_2\text{O}$, and this agrees with the composition ascribed to the salt in published statement. A solution of the salt in water at 60°F . was prepared, and a weighed proportion evaporated to dryness; 8.8675 grms. left .2385 gm., indicating a solubility of 1 part of the hydrated salt in 35.28 of water. Of another solution similarly prepared 9.297 grms. left .239 gm., indicating a solubility of 1 part in 35.45 parts water. The solubility of the crystallised hydrochloride may therefore be taken as 1 in 35.5 of water. Wherefore we conclude, that whether regarded from the point of view of solubility, stability, or neutrality, the hydrochloride is the best and most useful salt of strychnine.

Mr. MARTINDALE said the only objection to the use of neutral tartrate was that tartrate did not keep well in solution, especially if the substance was to be used as a hypodermic injection; and it was therefore preferable to use an inorganic acid, if possible. The hydrochlorate was perhaps one of the most soluble salts, though not quite so much so as he thought when he first recommended it; it would not dissolve so as to make a 1 in 40 solution in distilled water; but 1 in 62 (not 1 in 32, as it appeared by a printer's error in the last edition of his book). The acid sulphate had the advantage that on throwing it into water and shaking up, it dissolved immediately; whereas other salts either required heat or some amount of shaking. He was still, therefore, in

favour of that salt, which was fairly stable in acicular crystals, not only for injection, but for forming a solution of strychnine, which might be used as the official liquor strychninae. There was one slight disadvantage, that if made slightly more acid it was apt to crystallise out, as was shown by Dr. Paul and others; but if it were well and definitely crystallised, it had just the normal amount of acid, and would dissolve readily; it would also keep at any ordinary temperature.

Mr. COULL said Mr. Martindale had omitted one of the most important points in the note which he contributed last year, viz., that there was a certain amount of dissociation; it was not really acid sulphate of strychnia at all; he considered it was the neutral sulphate with some sulphuric acid. It was evident there was some decomposition, because when an excess of salt was put into a phial of water and shaken up, and then titrated to estimate the amount of sulphuric acid dissolved, you got more sulphuric acid than you did by evaporating a weighed portion and getting the solid residue. Again there was the hydrochlorate, and Mr. Duncan, who had been described by an American journal as "the calm, level-headed Scotchman who had settled the liquor strych. difficulty," could have corroborated what Mr. Dott had said had he remained. If the difficulty as to the solubility of the hydrochlorate could be got over, no doubt it would be preferable. He found by experiment that it was quite soluble at ordinary temperatures 1 in 50, so that Mr. Martindale might safely put that figure in his next edition.

Mr. LLOYD WILLIAMS said he was not prepared to advocate the use of any particular salt, but he might mention that quite recently the nitrate of strychnia had been extensively used in India as an antidote to snake poisoning.

Mr. BIRD said he had had some experience with the hypophosphite, on which a paper was read by Mr. H. W. Jones in 1889, and as far as he remembered it was very soluble.

Mr. DOTT, in reply, said he had only considered the matter from a practical point of view. He would not adopt the hypophosphite for ordinary use or for hypodermic injection unless it were considered necessary. As far as he knew, the hydrochloride answered most purposes required, and was sufficiently soluble for all purposes, certainly more so than the acid sulphate. Alkaloids did not seem to favour the formation of acid sulphates, though they formed neutral sulphates readily. He rather thought the nitrate would be insoluble.

Mr. TYRER said the solubility of the hypophosphite was about 1 in 20.

A vote of thanks was accorded Mr. Dott for his paper.

Mr. R. H. Davies read the next paper, entitled—

FURTHER NOTES ON EUCALYPTOL.

By ROBERT H. DAVIES, F.I.C., F.C.S., AND THOS. H. PEARMAIN.

In our communication on this subject to last year's Conference (*Year-Book*, 1891, p. 465) we expressed the hope that further experiments in more favourable conditions of temperature would enable us to give a more definite opinion as to the characters of eucalyptol, particularly the specific gravity. Through the kindness of Messrs. J. W. Drysdale and Co., who placed a good supply of the so-called oleosa oil at our disposal, we were able to take advantage of the cold weather of February last and prepare eucalyptol by the freezing-out process in a state of greater purity than before.

The temperature produced by a mixture of two parts snow with one of salt was $-20^{\circ}\cdot5$ C. (-5° F.), and working in the open air, the atmospheric temperature being the freezing-point or a few degrees below, it was easy to keep quantities of between one and two pounds at or just below -18° C. (Fahrenheit zero) for an hour or more.

At this low temperature it was found that without any previous fractionation three samples of oil gave abundance of crystals. These samples were the oils of *Eucalyptus Oleosa* so-called (now known as the product of *E. Cneorifolia*), *E. Dumosa*, and one stated by the importers as from *E. Globulus*.

After allowing time for crystallisation the whole was transferred to a small hand-press, capable of holding a quart, which was previously cooled, and after the oil had drained off the crystals were submitted to strong pressure, a firm white cake of eucalyptol being obtained. This was subsequently mixed with similar product from two further supplies of oil, and the whole refrozen and pressed twice.

This constitutes the bulk of the eucalyptol obtained. Some of it was very carefully distilled, using a "Bell Henninger's" fractionating tube, and it was found that, on this distillation, out of

75 c.c. taken 69 c.c. distilled at $174^{\circ}5$ C. Of this 69 c.c., on redistilling, 67 c.c. distilled at 175° C. by another thermometer, and on this 67 c.c. being again distilled it entirely came over between 174° to 175° , using a third thermometer. We think we may, therefore, assume that the boiling point of eucalyptol is $174^{\circ}5$ (uncorrected).

This thrice distilled product was examined as to action on polarised light, using a column of 220 m.m. The rotation of this, judging from three closely concordant observations, was $-10^{\circ}7$, from which the rotation of 100 m.m. would be $-4^{\circ}8$, and the specific rotation $[\alpha]_D 0.08$.

In our previous paper we have alluded to a sample of "pure eucalyptol," which we stated to have no rotation. This observation we find to be not strictly accurate. A column of 100 m.m. only was examined, and the deviation, when compared with those of other samples of eucalyptol, seemed to justify this opinion. On examination some months later, using the 220 m.m. tube, it was found to deviate the ray $+16'$, equal to $+7'$ for the 100 m.m. tube.

Our eucalyptol has, therefore, a smaller rotation and in an opposite direction to the sample we had regarded as pure.

The melting point of the crystals was 0° to $-0^{\circ}5$ C., and the solidifying point of the liquid $-1^{\circ}0$ to 0° C. The specific gravity was taken at the temperatures 4° C., 10° C., $15^{\circ}5$ C., 25° C., and 100° C., the comparison being made in each case with water at the same temperature. At 4° C. the gravity was .9342, at 10° C. .9139, at $15^{\circ}5$.9275, at 25° .9216, at 100° .8910.

Various figures have been assigned as to the specific gravity of eucalyptol. Jahn gives .923 at 16° C. and .940 at 0° C. (*Pharm. Journ.* [3], xv. 615); Merck gives as properties of eucalyptol puriss, boiling point 170° – 173° , specific gravity .910–.920 at 15° C. (*Pharm. Journ.* [3], xiv. 778); Schimmel (*Pharm. Journ.* [3], xx. 856) says, specific gravity .930, constant boiling point 176° – 177° .

In the mention of this substance in Watt's Dictionary, vol. ii., 2nd ed., p. 526, it is indicated that eucalyptol is probably identical with cineol, a remark that most recent workers endorse, but the sp. gr. of cineol is stated to be .927 at 16° C. as against .923 for eucalyptol. Our eucalyptol .9275 thus confirms the statement that eucalyptol is identical with cineol.

We have strong reasons for believing that the figure given by us is exceedingly near the true specific gravity. The crude oil taken

was frozen, and the crystalline product subsequently pressed for convenience in three separate portions, which may be called A, B, and C. The first, A, was pressed cautiously and not very hard. The second, B, having greater experience to guide us, we pressed more vigorously. The third, C, we squeezed as hard as was safe in the small hand-press employed.

It is fair to assume that the amount of mother liquor left in the crystalline cake was greatest in A and least in C, and as a fact the sp. gr. of these three was found to be at 15.5° C., A .9236, B .9245, C .9266, whilst after these portions had been mixed, frozen and submitted once more to the greatest pressure we could conveniently manage, the gravity of the liquefied cake was higher again, viz., .9271, and the portion of this that distilled constantly at 174–175 was found to be .9275, which we consider the true sp. gr. of eucalyptol.

Some experiments were made to ascertain how far the amount of eucalyptol that crystallized out could be taken as a measure of that contained in the oil submitted to cooling. For this purpose the eucalyptol was mixed in various proportions with substances regarded as containing no eucalyptol, and the mixture submitted to freezing.

The diluents chosen were (a) the fraction of *E. Amygdalina* oil coming over above 177° C., and (b) absolute alcohol.

(a) Diluting with amygdalina oil :—

Parts Eucalyptol.	Parts diluent.	
75	25	froze hard
70	30	froze
66.25	32.75	„
62.5	37.5	doubtful
50	50	would not freeze

The results with alcohol were of a very similar character.

Parts Eucalyptol.	Parts Alcohol.	
75	25	crystallised readily
70	30	froze
65	35	„ with difficulty
60	40	would not crystallise

The deduction from these experiments would seem to be that the process of freezing permits of a very large proportion of the eucalyptol remaining in the oil, the mother liquor of the crystals containing still somewhat more than 60 per cent. of its weight of true eucalyptol. So that though when combined with fractionation this process is extremely useful for distinguishing between oils rich and poor in this constituent, it will not serve as an accurate process for estimating the amount of eucalyptol the oil contains, though by making a correction for this eucalyptol in solution in accordance with the above results a better approach to accuracy will be obtained.

In our previous communication we stated that the evidence obtainable pointed to the fact that eucalyptol when pure did not absorb iodine when tested by Von Huhl's process; in other words, that its iodine absorption equivalent would be found to be *nil*. This opinion is confirmed by the examination of the sample last prepared; which was found by two experiments to absorb—

Exp. (a) 3.18 per cent., Exp. (b) 3.17 per cent. iodine as compared with our own manufacture last year, 22.15 per cent., and the sample of "pure eucalyptol" mentioned then, 7.14 per cent.

The solubility of salicylic acid in eucalyptus and other essential oils having been recommended as a means of detecting adulteration with oil of turpentine, some experiments were undertaken with a view to ascertaining how far various proportions of American turpentine affected the power of eucalyptus oil in this particular.

It was found that the sample of *cnearifolia* oil used in the preparation of eucalyptol required 3.17 parts for the solution of one of pure salicylic acid. The solvent powers of the mixtures examined were as follows:—

Eucalyptus Oil.	Turpentine.	Weight required to dissolve 1 of acid.
95	5	3.20
90	10	3.51
80	20	4.01
66.6	33.3	4.99
50	50	6.68
Turpentine alone	. . . .	141.40

From these experiments it will be seen that in the case of eucalyptus oil, at any rate, the test is not of great value. The solvent power of the oil is diminished by any increase in the proportion of turpentine; but it remains so considerable in the case of eucalyptus oil containing much eucalyptol, that the addition of even

an equal weight of turpentine does not give a number that we can feel sure is outside the range assigned to genuine oil.

The solvent power of eucalyptol itself was tried, and was found to be greater than any sample of oil so far examined; one weight of acid requiring 2.55 of eucalyptol for solution. It would thus seem probable that the solvent power of those oils of eucalyptus that contain a fair proportion of eucalyptol may be due in great measure to this constituent.

Mr. DOTT said the most interesting point about this communication was the result with regard to the boiling point of eucalyptol, as to which there was a considerable difference of statement. In some papers there seemed a tendency to assume a boiling point favourable to the particular oil the author wished to advertise; and any contribution, therefore, which threw a light on the exact boiling point was of great value.

Mr. GROVES asked if the authors intended to lay it down that the value of eucalyptus oil depended on the amount of eucalyptol it contained; because he did not think that had yet been ascertained. Eucalyptol had a less agreeable flavour than eucalyptus oil itself. He should be inclined to estimate the value of the oil by the odour. He was not aware whether any experiments had been made by medical men as to the efficiency of eucalyptol.

Mr. DAVIES said he was not aware of any experiments of that character that had been carried out. He did not wish to imply that the value of a sample of eucalyptus oil was necessarily in direct ratio to the amount of eucalyptol it contained; it was a fact that eucalyptol was one of the constituents of the oil; the question whether it was the really active constituent had often been asked, but no satisfactory answer had yet been given. It was quite true, as Mr. Groves said, that eucalyptol had not always the peculiar odour of eucalyptus oil. He had prepared eucalyptol from *oleum sem. santonica*, and from oil of cajeput, and apparently the more you purified these the less characteristic odour they had of the source from which they were derived; and the more absolutely identical they became. It was quite certain, therefore, that a pure eucalyptol would possess less distinctive odour than the oil from which it was derived. Whether it was or was not the active constituent, he was not prepared to say.

A vote of thanks was accorded the author for his paper.

The Conference then adjourned until the next day.

Wednesday, August 24.

The President took the chair at 10 o'clock, and the proceedings commenced by Mr. W. A. H. Naylor reading, in the absence of the author, a paper entitled—

NOTE UPON UNG. HYD. OXID. RUB., B.P.

By FREDERICK DAVIS.

According to the present British Pharmacopœia, this ointment is ordered to be prepared with hard and soft paraffin in the proportion of three parts of the latter to one of the former. It will be remembered the directions appended to the formula are as follows :—Heat the hard and soft paraffins together, and when the mixture in cooling begins to thicken add the oxide of mercury in a glass or porcelain mortar and mix the whole thoroughly. No further instructions with regard to cooling the ointment are given; in practice, however, it is found the resulting ointment is frequently lumpy, probably brought about by too rapid cooling. Of twelve samples of this ointment obtained from an equal number of sources, eight were found to be more or less lumpy, but it is pleasing to be able to state that in all cases the quantity of active ingredient came out to within a fraction of a grain of the amount prescribed; nevertheless, it may be considered that a lumpy ointment is an unsatisfactory one, and therefore I venture to suggest that pharmacists should, in all cases, cool this ointment slowly. Such a course can be easily adopted by standing the vessel containing the cooling ointment in another vessel containing warm water, and giving the ointment an occasional stir until it has assumed a state of solidity sufficient to prevent the hard paraffin from separating out. It appears to be rapid cooling which renders the ointment lumpy, and therefore the slow cooling of the warm water in the outer vessel obviates this. I have found, practically, that an ointment which has once become lumpy in the manner indicated, cannot be rendered satisfactorily smooth, even by continued rubbing, either upon a slab or by the aid of the pestle and mortar. It would appear that ung. hyd. nit. oxyd. has a peculiar tendency to become lumpy in this way, much more so than other B.P. ointments in which the basis is the same. I have, therefore, restricted my remarks to this ointment only.

Mr. GERRARD said the attention of pharmacists was drawn to this matter three or four years ago by some correspondence in the *Chemist and Druggist*, and the fact now mentioned was clearly brought out. It seemed that the ointment might be improved by the addition of a little more soft paraffin or a small quantity of oily matter if it did not interfere with the action of the ointment.

Mr. MAREN did not think there was any necessity for adding either soft paraffin or oil; if the ointment were cooled slowly, there was no difficulty whatever. There was no need for it to be lumpy, or for an alteration of the formula.

Mr. T. F. ABRAHAM thought he might take this opportunity of protesting against the too extensive use of hard and soft paraffins as ointment bases. In some cases it was distinctly an undesirable base, as, for instance, in the case of boracic acid ointment applied on lint to a painful and tender wound. In the course of a little time the soft paraffin melted, and was absorbed by the lint, or ran on to a portion of the body surrounding the wound, while the hard paraffin, bearing with it the boracic acid, remained firmly attached to the wound, and could only be removed with difficulty, causing great pain to the patient. Such an ointment made with lard, or possibly a mixture of lard and paraffin, would be far preferable.

Mr. GERRARD said the ointment to which Mr. Abraham had referred was introduced by Sir Joseph Lister, and the object of it was that it should be of such a nature that when applied to the surface of the body it could be easily removed without any of the ointment attaching itself to the surface; it was designed to act merely as a protective. At University Hospital they prepared as much as 56 lbs. at one operation, and they had to keep a lad stirring it constantly, while it cooled for a period of three or four hours, so as to obtain it in a soft, smooth, granular condition, containing a large amount of air. It could then be readily spread over lint, and his experience was that it could be very readily removed, and caused little or no pain. He was not arguing in favour of either hard or soft paraffin as an ointment base, but this ointment as devised by Sir Joseph Lister certainly seemed to answer its purpose.

The next paper, in the absence of the author, was read by Mr. Naylor:—

PODOPHYLLUM EMODI.

BY JOHN C. UMNEY.

This Himalayan drug, which was the subject of a communication by Dymock and Hooper to the *Pharmaceutical Journal* ([3], xix. 585), has recently been imported in considerable quantity, possibly owing to the opinion there expressed of its richness in resin, which "produced unmistakable cathartic effects." The chief botanical characters of the rhizome have been described by those authors; and the quantity of resin, determined by the official process for the preparation of podophyllum resin, found to be equivalent to 10 or 12 per cent.

The constituents of the resin have been examined by T. A. Thompson (*American Journal of Pharmacy*, vol. lxii., p. 245), who states that it contains more podophyllotoxin, to the extent of at least 25 per cent., than the resin of *P. peltatum*; and one would therefore expect it to be proportionately more active physiologically. As such did not appear to be the case on trial in several instances, it seemed desirable to make an extended examination of its constituents, following, if possible, the lines adopted by Podwissotzki in his examination of the resin of *P. peltatum*.

The recent suggestion of Professor Attfield, in his "Pharmacopœia" revision report, that, subject to confirmation, this species should be included for the preparation of the resin in future editions of that work, has made this detailed comparison of more importance.

The results of Podwissotzki's work on the resin of *P. peltatum* may be briefly summarized thus:—

The physiologically active portion of podophyllum resin consists of podophyllotoxin, which is composed of picropodophyllin, held in solution by picropodophyllic acid.

Picropodophyllin is a neutral crystalline principle, which, though the sole active ingredient of the resin, is inactive in its free state, owing to its insolubility, but in combination with, or more probably solution in, picropodophyllic acid is extremely active. The resin also contains an inactive acid—podophyllic acid, a yellow colouring matter—podophylloquercetin and fatty matter.

Extraction of the Resin.—The powdered rhizome was treated exactly in the manner described in the official process for the preparation of podophyllin resin, and was found to yield 11·4 per cent. of a pale lemon-yellow resin.

The solution from which the resin had been precipitated was markedly sweet in taste, and reduced Fehling's solution powerfully without inversion. It was found after concentration to possess no purgative action whatever, and was not further examined.

Separation of Constituents of Resin.—Podophyllotoxin.—10 grammes of the crude resin were exhausted by dry chloroform, free from alcohol, the bulk of the chloroform removed by distillation, and the residue poured into a large quantity of dry ether. The portion insoluble in ether was at first pasty, but afterwards became dry and brittle. (This substance is distinctly acid, and is described by Thompson as podophyllotoxin, but corresponds to the inert podophyllic acid obtained from *P. peltatum* by Podwissotzki.) The ether-chloroform solution was then filtered into a large volume of petroleum ether, when the podophyllotoxin was precipitated. This, when collected, washed and dried over sulphuric acid, was found to be equivalent to 17·8 per cent. It was readily soluble in chloroform, gave no precipitate with ether, indicating complete removal of podophyllic acid, but gave a deep green coloration with ferric chloride. This reaction pointed to the presence as an impurity of a body similar to that described by Podwissotzki and named by him podophylloquercetin, which will be described subsequently.

Podophyllotoxin is not soluble in solution of ammonia, but on heating with it is decomposed, forming a gelatinous precipitate and a frothy solution. The solution in ammonia, when shaken with ether and the ether evaporated, yielded abundant groups of long white needles of picropodophyllin.

Picropodophyllin.—Ten grammes of the crude resin were exhausted with cold chloroform and the solution evaporated to dryness. This was extracted with boiling petroleum ether and the residue dissolved in rectified spirit, mixed with lime and dried on a water-bath and finally exhausted with boiling absolute alcohol. The solution on evaporation and addition of water yielded an abundance of silky, needle-shaped crystals. These melted after recrystallisation at 208–210° C., and are undoubtedly identical with the crystalline substance obtained by Podwissotzki from *P. peltatum* which melted at 200°–210° C.

The quantity obtained was small, amounting to 2·6 per cent. of the resin, although a slightly larger percentage was obtained by a direct treatment of the rhizome as recommended by Podwissotzki.

Picropodophyllic acid was obtained by treatment of the crude

podophyllotoxin in solution in alcohol with ammonia, removing the picropodophyllin with ether and then liberating the acid from its ammonium salt by dilute hydrochloric acid. Considerable difficulty was experienced in purifying the acid owing to the readiness with which it is decomposed, and the impossibility of freeing it entirely from picropodophyllin. It is resinous in character, and agrees closely in general properties with the similar body obtained from *Podophyllum peltatum*.

Podophyllic acid was precipitated from the chloroformic solution by ether (as mentioned already under the heading of podophyllotoxin) in quantity equivalent to 30·8 per cent. It was thrown out in white flocks which rapidly aggregated forming a brown resinous mass, but which after drying was easily reduced to a pale greyish powder. It was distinctly acid to litmus, and melted at about 125° C. It was soluble in chloroform and alcohol, but insoluble in ether and water. It possessed, when free from picropodophyllin, no cathartic action whatever, and hence the description of this ether precipitate by Thompson as podophyllotoxin, the name applied by Podwissotzki to the active ingredient of the resin, has led to misconception. It was found necessary to remove the precipitate of podophyllic acid at once from the ether and chloroform solution, as its precipitation causes the crystallisation of a part of the picropodophyllin, and may lead to a considerable loss of that body.

Podophylloquercetin.—The crude resin after extraction with petroleum ether and dry alcohol-free chloroform was dried and extracted with ether, the ethereal solution concentrated and precipitated as a bright orange powder by alcoholic solution of lead acetate. The lead compound was decomposed by sulphuretted hydrogen and the liberated podophylloquercetin shaken out with ether. It was crystallised by the addition of benzole to the ethereal solution, and was purified by sublimation. The crystals, which became green on exposure to air, melted at 248° C., with slight decomposition. The amount obtained was equivalent to 1·35 per cent. of the resin.

Fatty Matter.—Petroleum ether removed from the crude resin 2·3 per cent. of a greenish fat, which differed from that obtained from the resin of *P. peltatum* in being non-crystalline and semi-fluid, whilst that from the latter exists in larger quantity, and is distinctly crystalline in character.

Podwissotzki, in his examination of the resin of *P. peltatum*, makes no mention of the proportions of the various bodies sepa-

rated therefrom, and on this account experiments under similar conditions have been made upon a sample of the resin from the rhizome of this species to determine its relative composition.

	<i>P. Emodi.</i>	<i>P. Peltatum.</i>
Resin, by official process for podophyllin resin	11.4 p.c.	5.9 p.c.
Constituents of the resin—		
Podophyllotoxin (erude)	17.8	33.8
Pure crystalline picropodophyllin	2.6	4.5
Picropodophyllin acid	not determined.	not determined.
Podophyllin acid	30.8	6.9
Podophylloquercetin	1.3	2.4
Fatty matter	2.3	5.7

The supposition of Podwissotzki that the activity of resin of podophyllin is dependent on the amount of picropodophyllin which it contains in solution in picropodophyllin acid, receives confirmation from the above figures, which show that the resin from *P. emodi* yields a considerably smaller proportion of crystalline picropodophyllin than *P. peltatum*. The near relationship of the roots is evidenced by the close agreement in character of their several constituents, but the value of *Podophyllum emodi*, dependent on the larger quantity of resin present in it, is counterbalanced by the smaller proportion of the active ingredient present in that resin. Briefly to summarise, the rhizome of *Podophyllum emodi* yields nearly double the amount of resin yielded by *P. peltatum*, but that resin contained only about half the quantity of crystalline picropodophyllin to which the value as a cathartic is due.

Hence it is undesirable that *P. emodi* should be employed as an alternative source for the preparation, according to the official process, of podophyllin resin.

The PRESIDENT said this was a very valuable paper, and deserved more attention than he feared they had time to give it. Their thanks were due to Mr. Umney for his most useful communication.

Mr. Moss said he had done a little with the *P. emodi*, and had had a specimen sent him from, he believed, the same lot as Mr. Umney had examined. The value of all these things was determined by the manner in which they performed the duties

expected of them. In separating the active principle podophyllin from this species, he obtained, as Mr. Umney had done, a larger proportion of resin than from *P. peltatum*, but on experimenting with it he found its action to be most capricious; sometimes it was effective, and sometimes—with the same person—it was not, and it varied also with different persons. He quite agreed that it was not desirable to add it to the *materia medica*.

Mr. REYNOLDS said there would be no fear of any confusion arising between these two plants, as the appearance was quite different. The leaf of the *P. emodi* changed to a rich red in summer, whilst the other retained its peculiarly bright green colour. He had them both in his garden, and they were interesting specimens, and might be recommended to pharmacists for cultivation.

The PRESIDENT here announced that Professor Sayer, Dean of the Department of Pharmacy in the University of Kansas, and a member of the Revision Committee of the United States Pharmacopœia, was present, and he was quite sure the members would accord him a hearty welcome. He invited him to take a seat on the platform.

Professor SAYER said it gave him a great deal of pleasure to be present at the meeting, and in fact, when leaving the United States on June 4th, he arranged his journey to the continent of Europe with a special view to attending the Conference. Unfortunately, however, he was not in time to hear the papers on the preceding day. With regard to the United States Pharmacopœia, he might say that the Committee of Revision had been laboriously at work during the last two years, and he hoped that by the time he returned the first pages of the new edition would be ready for the press. He learned for the first time on reaching London of the death of Professor Bedford, and he could not express how much the news had saddened the remainder of his visit, the Professor being one of his personal friends. He hoped the remainder of the Conference would prove both pleasurable and profitable to the members.

The next paper read was—

A NEW METHOD FOR THE ESTIMATION OF GRAPE SUGAR.

By A. W. GERRARD, F.C.S.,

Teacher of Pharmacy to University Hospital.

During the latter part of the year 1889, whilst engaged in making some of the so-called double cyanide of zinc and mercury, then recommended by Sir Joseph Lister as an antiseptic, I was led out of curiosity to attempt the preparation of other double cyanides. The method followed was the ordinary one of double decomposition, whereby a solution of cyanide of potassium is added to a solution of another metallic salt. Amongst the results obtained, my interest was chiefly centred in the formation of a colourless copper compound, which on examination proved to be a double cyanide of copper and potassium. To prepare this salt a 10 per cent. solution of the purest cyanide of potassium is slowly poured into a 10 per cent. cold solution of copper sulphate until the mixture is colourless. The chemical changes which occur during the progress of the reaction are apparently of a complex character, as is evident by the various-coloured products obtained during the admixture of the two salts. On adding the cyanide to the copper salt, a pale green precipitate first appears which soon darkens to brown; the precipitate then gradually dissolves, producing a solution of a purplish colour, which a few drops more cyanide solution render colourless. To obtain the salt in a crystalline form the solution may be evaporated over sulphuric acid, when crystals of sulphate of potassium are first deposited. On removal of these the mother liquor on further evaporation yields transparent crystals of the double salt. Whilst engaged in preparing this salt the thought struck me that possibly, like cyanide of potassium, it might act as a solvent of certain oxides, especially cuprous oxide, and if so could be utilized in Fehling's solution after the manner that Dr. Pavy uses ammonia in his test solution; that is for the purpose of preventing the precipitation of cuprous oxide during the estimation of grape sugar. A few tentative experiments soon demonstrated that my inference was correct, likewise that under conditions to be described cyanide of potassium alone might be added to Fehling's solution with exactly the same result as would follow

the employment of the double cyanide of copper and potassium, thus simplifying the preparation of the test solution.

The following experiments were made for the purpose of constructing a working formula :—

1. To 1 vol. Fehling's solution enough cyanide of potassium was added to just remove its blue colour. On boiling a portion of this with grape sugar, no apparent reduction took place. Therefore the double salt formed is not itself affected by grape sugar.

2. Another volume of Fehling's solution was just decolorised by potassium cyanide, and mixed with a second equal volume of Fehling's solution; a portion of the product on boiling with grape sugar gave no precipitate, but a steady disappearance of blue colour. On estimating the amount of copper available for reduction in this solution, or what is the same thing its glucose value, it was found that 10 c.c. was reduced by 0.25 gramme glucose, a loss of half its value, as compared with Fehling; 10 c.c. of which equals 0.5 gramme glucose. This loss is evidently due to combination of half the copper with the cyanide.

3. In this experiment Fehling's solution was prepared with twice the usual amount of copper sulphate, and divided into two equal volumes. One volume was just decolorised with potassium cyanide and mixed with the second volume. A portion of the mixture on estimation proved to have approximately the same sugar value as Fehling's solution—10 c.c.=0.5 gramme glucose. During reduction of this solution no precipitate formed, but it gradually changed from blue to colourless.

4. This experiment was made to ascertain the influence of both excess and deficiency of cyanide on the solution. With excess the sugar value was lowered; with deficiency the result was peculiar, yet quite consistent with circumstances. On running the sugar solution into the hot test solution, the blue colour faded up to a certain point, when a yellow precipitate began to appear, and continued to form till reduction was complete.

The lesson of these experiments was to show that cyanide of potassium does not act merely as a solvent of the cuprous oxide, for it evidently cannot be added to Fehling's solution without forming the double salt referred to. It was also evident that the cyanide must be added in definite proportion. A double amount of copper sulphate must also be used to satisfy the cyanide. For the purpose of determining the amount of cyanide of potassium required to unite with the extra sulphate of copper, 100 c.c. of Fehling's solution was made with double its ordinary amount of

copper sulphate. To this was carefully added just enough cyanide of 98 per cent. strength to bring the reducible copper value to that of ordinary Fehling's solution. After at least a dozen experiments, it was found that 100 c.c. of the Fehling required an average of 3.3 grms. of the cyanide, which quantity I have adopted for my formula. It may here be pointed out that as the best cyanide of potassium varies slightly in strength, a little more or less than the above quantity may be required, a point which may be easily determined by a method described below.

In my earliest formula for the new solution, I adopted the plan generally followed with Fehling's solution; that is, keeping the copper sulphate in one bottle, and the alkaline salts in another. It however soon became evident this was not satisfactory; for the alkaline mixture in a few days gave off ammonia gas, from decomposition of the cyanide, thus weakening the test. This circumstance determined me to keep the cyanide apart from the alkalies, so that three solutions have to be employed, when estimating sugar by this new process. For the convenience of those who may wish to employ this method I give the formula:—

Solution No. 1.

Take of—

Copper Sulphate recrystallised . . . 69.30 grms.
Distilled Water to 500 c.c.

Dissolve.

Solution No. 2.

Take of—

Tartarated Soda crystallised . . . 175.00 grms.
Caustic Soda (pure) . . . 76.56 „
Distilled Water to 500 c.c.

Dissolve.

Solution No. 3.

Take of—

Cyanide of Potassium (98 per cent.) . . 33 grms.
Or a sufficiency.
Distilled Water to 500 c.c.

Dissolve.

For the purpose of testing the solutions, 5 c.c. of each are mixed with 50 c.c. distilled water, then boiled. Whilst boiling add a solution of grape sugar until the blue colour is discharged. If

any precipitate is formed, more cyanide must be added to No. 3, until again on boiling equal volumes of the mixed solutions with grape sugar, they cease to precipitate.

I have employed these solutions for some time with considerable satisfaction, and the advantage which I believe may be fairly claimed for them over Pavy's solution is, that they can be boiled in an open vessel, which does away with the long tube and flask employed to condense the ammonia used in Pavy's test.

As compared with Fehling's solution, the advantage is that the end reaction is very sharp, filtration is avoided, time is saved, and experimental error reduced.

In conclusion I will give exactly the method I follow for a grape sugar estimation, when using what may now be termed the cyano-cupric test. Measure 5 c.c. each of solutions No. 1, 2, and 3 in the order given; add 50 c.c. water, and boil in a porcelain capsule. Have ready a urine containing sugar, one volume of which has been diluted to ten volumes with water. Fill a burette with same. Run this steadily into the boiling test solution until the blue colour has gone. The urine may be added slowly towards the end of the reaction. For accurate observation it is usual to make a second and more rapid estimation, so as to check error that may arise from too long boiling.

There is just one point more to touch upon in connection with the cyano-cupric test. It is that after reduction it soon oxidises, reassuming its blue colour. This, of course, must not be mistaken for incomplete reduction, as the same thing happens with both Fehling's and Pavy's tests.

The PRESIDENT said this method seemed to be an improvement on the ordinary process, but it had the disadvantage of requiring three solutions. He supposed, however, that they would all keep well when made.

Mr. ALLEN said he had listened to this paper with a great deal of pleasure, but, like the President, he felt it was important to know whether the solutions would keep. He was not sure whether he understood Mr. Gerrard correctly to say that the third, the cyanide solution, would keep, and feared that when mixed with caustic alkali and tartrate that it would not. It was a well-known fact, which might militate against the convenience of the process, that a solution of cyanide of potassium, kept by itself, underwent somewhat rapid decomposition, forming formate of potassium and

ammonia. One would always have to be setting the cyanide solution, and as you started with an uncertain proportion, which might be up to 98 per cent., or less or more, it was a little indefinite. He failed to see how you could be quite certain as to the proper amount of cyanide to add. As he understood it, the cyanide of potassium was really used as a solvent for the cuprous oxide. Mr. Gerrard said there was no reduction of the Fehling's solution in the presence of cyanide, but he presumed he meant no precipitation; the reduction would occur by the sugar. Unless there were some easy means of regulating the strength and quantity of the cyanide used, he feared there would be a difficulty, but he fully appreciated what was said about the inconveniences of the ordinary Fehling method. It had been said that an analytical method would find its own level, but he had often thought that Fehling's method stood on a higher level than it was entitled to, and hence the many attempts to improve or modify it. Pavy's ammoniacal method was one which was objectionable on account of the complexity of the apparatus and the ammoniacal vapours, and if Mr. Gerrard had succeeded in replacing that he had achieved a considerable step in advance.

Mr. GROVES asked if Mr. Gerrard had tried the modification of Fehling's method, recommended by a French writer, which consisted in the addition of ferrocyanide of potassium to the ordinary Fehling solution. This had the effect, not of preventing precipitation, but of depriving the precipitate of the red colour, so that the blueness of the liquid was easily distinguishable. He had tried it a few times, but could not say he altogether liked it.

Mr. MARTINDALE asked what advantage this method possessed over that of Pavy. He feared the exposure of this to the air would cause absorption, just as with Pavy's. The use of a flask in the ammoniated copper solution of Pavy was to prevent the access of air, and re-absorption of oxygen. He feared the same thing would occur here, and cause greater error even than that in Pavy's method. That process was but a rough one; but for a simple preliminary estimation of sugar in urine it answered sufficiently well.

Mr. BIRD said it seemed to be considered a great desideratum to be able to use only one solution, and some years ago there was a note in the *Year-Book of Pharmacy* suggesting the use of glycerine instead of alkaline tartrate. He tried such a solution and found it very satisfactory, but it required to be set aside for a week or two, when a certain amount of reduction took place,

the clear liquid could then be poured off, and would keep almost indefinitely.

Mr. GRIERSON thought this paper was most interesting, and gave one the impression that a very great improvement had been made on Pavy's method. Every one knew that Fehling's method of estimating grape sugar was almost inapplicable in ordinary practice, and that Pavy's had recently been preferred on account of its sharp end reaction; but the great objection to it was the care required in execution, and the somewhat complicated apparatus required. He was in hopes that this cyanide method would get over the absorption which produced the blue colour in the Pavy test, but his difficulty was the same as had been mentioned by Mr. Martindale, and the question whether the cyanide solution would keep was also important.

Mr. GERRARD, in reply, said he did not expect to satisfy everybody. Mr. Allen had misunderstood his remark about no reduction taking place; he referred to the fact that when Fehling's solution was treated with cyanide of potassium until it was colourless, no further reduction took place, so far as he knew, when it was treated with grape sugar.

Mr. ALLEN remarked that there was no means of seeing it.

Mr. GERRARD said there was no evidence, either for it or against it. He did not say absolutely whether it was so or not; but there was no evidence of reduction, no precipitation. The cyanide salt formed seemed to be very stable. His attention had been drawn to the ferrocyanide of potassium method mentioned by Mr. Groves sometime after he had prepared these solutions, and he tried several experiments with it, but did not succeed very well and gave it up. There were other salts which would act much in the same way as cyanide of potassium, the sulphocyanides, or thiocyanides, and likewise the thiosulphates, but none of them seemed to act so well as the cyanide of potassium. Mr. Martindale and others thought the re-oxidation which took place after the reaction was complete was an objection, but he should like to know why. When you had once removed the blue colour, you knew you had got to the end of the reaction; and if it came back as blue again in five minutes as it was at first, it would make no difference in the estimation. Both Fehling's solutions and Pavy's did exactly the same thing. He had had no experience with glycerine, but was inclined to think it would be useful. With reference to the keeping property of the solution of cyanide of potassium, he had kept it for three months and found no difference in its value.

The testing solution was very easily made. You had only to make the ordinary Fehling solution of double copper strength, take half a volume of it, add just enough solution of cyanide of potassium to decolorise the one half volume, then add it to the other, and you could proceed with the test.

A vote of thanks was accorded to the author for his paper.

The next paper read was—

POTASSIUM BROMIDE.

By D. B. DOTT, F.R.S.E.

The tests for the purity of potassium bromide, as given in the "British Pharmacopœia," are fairly complete; being intended to guard against all probable impurities. The volumetric test may be regarded as of most importance, it being ordained that "not less than 838, not more than 850 grain-measures of volumetric solution of nitrate of silver" are required to precipitate 10 grains of the potassium bromide. The absence of iodine having been proved, it is assumed that the precipitation by nitrate of silver can only be due to bromide, or to a mixture of bromide and chloride. If the potassium bromide were perfectly pure, 10 grains of the salt would require 839.6 grain-measures of the standard silver solution; the Pharmacopœia, therefore, apparently allows a very slight deficiency of bromide, or the presence of a small percentage of chloride. It is obvious, however, that if a sample of bromide be contaminated with salts which do not yield a precipitate with nitrate of silver, a considerable amount of chloride may be present, and yet not be indicated by the official test. In other words, a sample may indicate 100 per cent. by the volumetric test, and still, as a matter of fact, be decidedly deficient in bromide. For instance, the greater the amount of moisture, the greater the amount of chloride which may escape detection. In a word, the volumetric test with argentic nitrate is not by itself capable of determining the purity of a sample of bromide. Nor would it be an easy matter to ascertain the nature and amount of all the possible impurities present in small percentage in the salt; yet this would be necessary before one could interpret with certainty the results of the volumetric estimation.

The best method of valuation of the bromide appears to be the determination of the amount of bromine actually present. Whether

some fractional proportion exists, as sodium or magnesium salt, is of no importance from the physiological point of view. What is required in the medicinal salt is that it should contain the full amount, or very nearly the full amount, of bromide, and be of practically constant composition. Having these points in view, the potassium bromide of three different makers was examined in manner as follows. The pharmacopœial tests were first applied and the moisture determined. Iodine having been proved to be absent, a weighed portion of each sample was dissolved, nitric acid and excess of argentic nitrate added, the precipitate consisting of bromide and chloride of silver. This was collected in the usual way, heated to fusion, and weighed. A weighed quantity of the mixed silver salt was then maintained in a state of fusion in a bulb-tube, while dry chlorine was passed through until the weight remained constant, *i.e.*, until the mixed salt was entirely converted into chloride. From the loss in weight the percentage of bromine is found. Knowing, then, the proportions of chloride and bromide of silver, it is easy to calculate the corresponding proportions of chloride and bromide of potassium.

Three samples of potassium bromide, which we may call A, B, and C, were examined according to the pharmacopœial tests and by the method above described. I find difficulty in obtaining very precise results in titrating bromide with solution of silver nitrate, partly on account of the colour of the bromide of silver, but possibly, also, because of the relative affinities of bromine and chromic acid not differing so greatly as those of chlorine and chromic acid, the end of the reaction is not so sharply defined as in the titration of chloride. 1.355 gramme of sample A was dissolved and diluted to 500 c.c. Of this, 50 c.c. was titrated with standard silver solution, potassic chromate being used as indicator. 40.0 c.c. were required. 1.1965 gramme of sample B similarly tested, 50 c.c. required 35.5 c.c. of the silver solution. 1 gramme of sample C tested in same way, 50 c.c. required 30.1 c.c. to precipitate. If these results are calculated as indicating bromide of potassium alone, then—

A	99.01 per cent.
B	95.51 "
C	100.95 "

These samples are all within the B.P. limits, although sample C is very near the border line. As the standard silver solution was simply prepared by dissolving a weighed quantity of the

nitrate so as to make 1 c.c. = 1 mgrm. of chlorine; the strength of the solution was tested as follows:—100 c.c. were mixed with nitric acid and excess of hydrochloric acid, and the precipitate collected and ignited, weighed 4035 grm. =

·0009968 grm. Cl. in 1 c.c. (old atomic weights),
 ·0009976 " " (new " "),

showing that the crystallised nitrate of silver employed was not quite equal to 100 per cent.

The moisture in the samples was estimated by drying a quantity of the powdered salt at 100° C.

A 2·764 grm. lost ·028 = 1·01 per cent.
 B 2·7675 " " ·017 = 0·61 "
 C 1·956 " " ·026 = 1·32 "

Each of the samples was then tested, by precipitating with nitrate of silver, and passing chlorine over the dried precipitate as formerly described.

A. 2840 grm. gave 4415 precipitate. 9015 grm. of precipitate lost in weight by treatment with chlorine 213. This figure, multiplied by 1·7967, gives the bromine 38269 grm.

B. 371 grm. gave 5775 grm. precipitate, 1·53 grm. precipitate lost 358 = 6432 bromine.

C. 345 grm. gave 535 grm. precipitate, 886 precipitate lost 1995 grm. = 3584 bromine.

All these results indicate:—

	A	B	C
Potass. Bromide	98·241	97·415	93·401
" Chloride	·197	1·004	3·973
Water	1·010	·610	1·320
Undetermined	·552	·971	1·306
	<hr/> 100·000	<hr/> 100·000	<hr/> 100·000

These numbers seem to show that there is considerable variability in the composition of the commercial salt, and that the present pharmacopoeial tests are not quite sufficient. It might be useful to introduce an additional test fixing a limit to the percentage of silver salt yielded by precipitation, and fixing a minimum percentage of loss on fusing the same in a current of chlorine.

This test would have the additional merit of forming an interesting exercise for candidates for the pharmaceutical license.

The PRESIDENT said he did not know whether the sample examined represented the usual manufacture of bromide; but it would be very difficult to reduce the percentage of chloride below what was there shown. No. 1 would be an extremely pure commercial article.

Mr. E. J. PARRY said it was characteristic of the crystalline form of bromide of potassium, that it would allow of practically no impurity, except one which would yield a reaction on titration with nitrate of silver; and consequently titration with nitrate gave an accurate estimation of the amount of bromine present; for instance, sulphate of potassium would not crystallise with bromide. The B.P. required that this substance should be sent out in the crystalline form.

Mr. Dott was thanked for his paper.

The next paper was read, in the absence of the author, by his father, Mr. J. B. Stephenson.

JAMBUL: ITS INFLUENCE ON THE ACTION OF DIASTATIC FERMENTS.

BY THOMAS STEPHENSON, F.C.S.,

Pharmaceutical Chemist, Bombay.

The literature of *Eugenia Jambolana* presents a curiously mixed record of success and failure in the various attempts to prove its efficacy as a remedy for diabetes. Many a troublesome case of this disease it seems to have entirely cured, while on the other hand it has as many times failed absolutely to be of any use whatever. But what must strike the ordinary observer as most remarkable is the way in which the drug appears to constantly assert itself in spite of a number of hits, hard enough to have sunk many a better known remedy. This seems to prove that it must be possessed of at least some virtue, or we should have heard the last of it long ago. It was with the object of ascertaining, if possible, to what cause the numerous failures should be ascribed that the experiments recorded in this note were made.

Eugenia Jambolana, Lam. (*Syzygium Jambolanum*, D.C.) is a very common tree in India. The bark has long been used by natives as a remedy for diarrhoea, being very astringent; and a syrup prepared from the juice of the ripe fruit, which is also very astringent, has also been used for a similar purpose. Astringency is also a very marked characteristic of the seeds, which according to Elborne (*Pharm. Journal*, May 5th, 1888) contain as much as 1.65 per cent. of gallic acid. It is not, however, on account of their astringency that they have been employed in medicine, but because of the peculiar property they appear to possess of arresting the action of diastatic ferments in converting starch into grape sugar. If they really act in the manner described, they should prove a very useful remedy in diabetes; and that they actually influence the action of such ferments has been proved beyond doubt by Lascelles-Scott and also by Balfour and Woodhead, as well as in the experiments here recorded. The natives of India have employed the seeds for centuries as a remedy for this complaint. Some doubt appears to exist as to whether this property is possessed in greater degree by the pericarp or the kernel of the seed. Maisch states (*Year-Book of Pharmacy*, 1886, p. 208) that "the rind of the fruit is said to contain the active principle." As the fruit resembles very closely the ordinary English plum in structure, it can hardly be said to possess a "rind" in the sense in which we regard it; so this statement is obviously erroneous. Dymock (*Pharmacographia Indica*, vol. ii. p. 28) says:—"Whether the active principle is contained in the pericarp or the kernel cannot as yet be decided to a certainty. Probably it is contained in both, but to a greater extent in the pericarp." This statement should have the effect of inducing experimenters to work with either the entire seeds or the pericarps only; whereas it appears that all experiments hitherto made, chemical and therapeutic, have been made with the dried kernels alone. As to what this active principle is, or what causes the action that these seeds appear to have on diastatic fermentation, no one has as yet been able to inform us. An unstable glucoside, jambulin, has been said to exist in the seeds, which, it has been suggested, might have the influence referred to; but its very existence is at present problematical. It was not, however, with the view of settling this question that these experiments were undertaken, but rather to ascertain how the power of the seeds to arrest the formation of sugar was influenced by various conditions. As the age of a drug, as well as the process employed in making

medicinal preparations from it, has always a greater or less influence on its therapeutic activity, the following experiments were made with a view to determining in what form jambul could be rendered most efficacious in arresting the diastatic fermentation of starch.

Twenty-one grammes of arrowroot starch were treated with 700 c.c. boiling water, and when cooled to about 100° F. the liquid was divided into seven equal portions, to each of which was added 2 grammes extract of malt. The various preparations of jambul mentioned below were then added, and the solutions kept for two hours at a temperature of 96° to 100° F., after which each was diluted to 400 c.c. and the sugar estimated by means of Fehling's solution. In the table the sugar is given as glucose. This, though hardly correct, is sufficiently so for our purpose, the results being only comparative. The following are the additions made to the seven portions of starch and malt solution, care being taken to exclude starch from all the preparations of jambul used:—

No. 1. No addition.

No. 2. Thirty grains powdered jambul, *from old stock*, in the form of tincture.

No. 3. Thirty grains pericarps only, *fresh*, in the form of tincture.

No. 4. Thirty grains kernels only, *fresh*, in the form of tincture.

No. 5. Thirty minims liquid extract jambul, purchased.

No. 6. Thirty minims ext. jambul liq. from fresh kernels, *and concentrated by heat*.

No. 7. Thirty minims ext. jambul liq. from steam-dried kernels, *not concentrated by heat*.

The following table shows the result after two hours' treatment:—

Sample.	10 c.c. Fehling's solution required for reduction.	Representing sugar calculated as glucose.
1	19.0 c.c.	1.05 gramme.
2	19.0 "	1.05 "
3	20.0 "	1.00 "
4	26.0 "	0.77 "
5	19.0 "	1.05 "
6	23.0 "	0.87 "
7	23.0 "	0.87 "

From the above we see that the best result was given by No. 4, showing that the greatest influence over the action of the diastase

was possessed by a preparation of the fresh kernels by a process avoiding the use of heat. As far as this property is connected with their medicinal action, therefore, it follows that such a preparation would be most efficacious therapeutically. Next to that in efficacy comes No. 6, the slight difference being evidently due to the heat employed in concentration. The result of No. 7, in which the seeds were dried over a steam-bath, confirms this supposition. An experiment, however, showed that four parts of steam-dried seeds represented $6\frac{1}{2}$ parts of fresh seeds, so that comparatively the latter stand to the former as 1.625 to 1 as regards therapeutic action. The pericarps (No. 3) have a much feebler action than the kernels, and, as they represent about 7 per cent. of the entire seeds, it is advisable both on economic and therapeutic grounds to discard them in making any preparation of the drug. The sample of old powder, as well as the purchased liquid extract, which appears to have been made from old seeds, had absolutely no action whatever. The relative influence which the various forms of the drug possess on the formation of sugar may therefore be tabulated as follows, the figures representing the amount of sugar which would have been formed in their absence:—

No. 2. Old seeds	0.00
No. 3. Pericarps	0.05
No. 4. Fresh kernels	0.28
No. 5. Old extract	0.00
No. 6. Fresh kernels, with heat	0.18
No. 7. Steam-dried kernels	0.11

The pulp of the fruit is of course out of the question in such experiments, as it contains an amount of sugar in itself which would not only interfere with the results, but at once condemn it as a remedy for diabetes. We have here, then, some explanation of the very discrepant results which have appeared with regard to jambul and its action in diabetes. There can be no doubt that in the majority of cases old seeds were used; while the probability that the extraction was made by heat in cases where preparations of the drug were employed, is equally great. A preparation of jambul, to represent its full medicinal activity, should therefore be made from fresh seeds, discarding the pericarps; and heat should be avoided. A weak, alcoholic menstruum, I find, extracts the constituents, making an active and stable preparation; and a liquid extract may be made by percolating with dilute spirit (25

per cent.) until about three-fourths of the product is obtained, setting this aside, and exhausting with water, finally evaporating the weak percolate to small bulk, to make up the amount represented by the drug. The American repercolation process might with advantage be employed in the case of this drug. Any preparation of the drug may readily be tested on the lines laid down in the foregoing experiments, by simply adding a definite quantity to a solution of starch and malt and letting it stand for an hour or two at a suitable temperature along with a similar starch solution containing no jambul. The two solutions may then be estimated by means of Fehling's solution, and the value of the preparation, therapeutically, roughly estimated by this means. From the above statements it is evident that some means of preserving the fresh seeds is a desideratum, and this I hope to be able to investigate later on. In conclusion, I can only express a hope that this short note may do something towards setting at rest some of the doubts that have arisen with regard to a drug which, doubtless, is destined to prove a valuable addition to our Indian *materia medica*.

The PRESIDENT remarked that this paper came all the way from Bombay from a son of the gentleman who was President when last the Conference met in Scotland, and who had now read it. It was a most important paper, as it appeared to fix the part of the plant in which the active principle resided.

Mr. REYNOLDS said the subject of jambul was referred by the British Medical Association to its Therapeutic Committee. He was not aware of the full details of the report, but he understood it was thought sufficiently promising to warrant the recommendation that clinical experiments should be made with much larger doses than had hitherto been given in England. Instead of the drachm doses per diem, or 5 or 10 grs. per meal, the Committee recommended that 1 oz. of the powdered seeds should be given in the course of a day. The experiments showing which portion of the plant and under what conditions the drug should be used, were much in advance of anything yet published in England, and the matter was of great importance, as this drug was employed for a disease which interested the medical profession very greatly.

Mr. GRIERSON said Mr. Stephenson had shown very clearly the part of the plant in which the active principle resided, but he did not attach much importance to its action in preventing diastatic

fermentation. It was shown yesterday that many chemicals, such as sodium carbonate, entirely prevented the formation of glucose from starch by amylolytic ferments, and jambolana appeared to be another example of the same thing, and no doubt many other things would do the same. But if he understood the drift of the paper, it was to indicate that jambul was a cure for diabetes, because it prevented the conversion of starch into glucose by diastatic ferments, but that was more than doubtful. Diabetes was supposed to be caused by some failure on the part of the liver to reconvert the sugar already formed in the duodenum into something else; at any rate, any starch which entered the system must be converted into sugar before any use could be made of it; the further action which took place in the liver, if he remembered aright, was the reconversion of the sugar into glycogen or something else, and diabetes was caused when the liver failed to effect this reconversion.

Mr. J. B. STEPHENSON thought Mr. Grierson had overlooked the object of the paper, which was simply to give the relative value of different parts of the fruit. The therapeutic action was quite outside the scope of the paper.

Mr. ARTHUR said it was well understood now that drugs administered by the stomach had no action on diabetes. Jambolana seeds had been extensively used in Edinburgh for some time past, it being three or four years since they were first introduced at the Royal Infirmary. At that time he made a fluid extract, 1 in 1, made with spirit according to the American process. The only good result was with a girl of about seventeen years of age; she had been taking 10 to 12 grs. of codeine a day, and was apparently improving, but when this wonderful new drug came out it was tried, and in forty-eight hours she died of diabetic coma. Since then he had had a great deal of it through his hands, but it was found wanting in efficacy. He could confirm what Mr. Grierson had said that the administration of drugs to prevent fermentation had nothing to do with the question of diabetes. The cause of diabetes lay either in the liver, the spleen, or the kidneys, or perhaps in all three. He hoped Mr. Stephenson would further investigate this matter.

The next paper was entitled—

EXPERIMENTS ON THE ALKALOID OF TEA.

BY ALFRED H. ALLEN.

I have recently been engaged on experiments having for their primary object the determination of caffeine. These have extended far beyond my original intention; and as they throw light on certain obscure or little known points, their general tendency is worth recording. Some of them are merely confirmatory of facts already established, but others are not in accordance with views widely held.

I may premise that I assume the alkaloids of tea and coffee to be absolutely identical, notwithstanding that their identity has been questioned by competent judges.¹ As caffeine is a more convenient name than theine, I shall usually employ it, although my experiments relate to the alkaloid extracted from tea. Commercial caffeine, in fact, is always obtained from tea. A few years since the manufacture was almost monopolised by Germany; but, in consequence of a revised regulation of the English customs, in accordance with which caffeine is admitted duty-free, provided it be "denatured" and rendered wholly unfit for human consumption by treatment with lime and asafœtida, it has been possible to use such tea profitably in the manufacture of caffeine. As a result, England has become the chief seat of the manufacture, and now exports the alkaloid to Germany and America. The present price of caffeine is about 7s. 6d. per lb.

The recorded statements respecting the behaviour of caffeine when heated are very discordant. Thus it is stated by A. Wynter Blyth that sublimation commences at about 79° C., and that it is impossible to expose caffeine to a temperature of 100° C. without danger of material loss. This statement, if correct, invalidates the great majority of the methods by which it has been attempted to estimate caffeine, and hence the behaviour of the alkaloid on heating has been carefully investigated in the author's laboratory, and the following facts definitely established.

1. Commercial caffeine (crystallised) lost 6·9 per cent. of its

¹ According to Lauder Brunton and Cash (*Proc. Royal Society*, 1877), the physiological effects of the alkaloids from tea and coffee exhibit marked differences. Theine (from tea) appeared to be more powerful in its action than caffeine (from coffee), and tended to produce rhythmical contractions of the voluntary muscles.

weight by prolonged drying over concentrated sulphuric acid at the ordinary temperature and pressure.

2. Caffeine which has been dried at the ordinary temperature over sulphuric acid till constant in weight undergoes no further material loss on prolonged exposure in an open dish in the water-oven at 100°. The following results were obtained:—

	Caffeine. Grammes.	Loss. Per cent.
Weight of commercial alkaloid taken	1.000	—
Weight after long exposure over H_2SO_4 at 20° C. . .	0.931	6.9
Weight after heating in water-oven for 2½ hours . .	0.929	7.1
Weight after heating in water-oven for 6½ hours . .	0.929	7.1
Weight after heating in water-oven for 51 hours . .	0.927	7.3

3. Notwithstanding the foregoing results, on heating caffeine contained in a watch-glass over boiling water on the top of the water-oven for fifteen minutes, a distinct film appeared on the covering-glass, and crystals (of caffeine) were observable under the microscope. The slight loss of weight observed when caffeine was exposed for many hours at 100° is doubtless due to volatilisation.

4. On exposing dry caffeine to a temperature of 120° in an air-bath, a very gradual but continual decrease of weight was observed, indicating sensible volatilisation of the alkaloid at the temperature employed. Thus:—

	Weight of Alkaloid.	Loss.	
		Grammes.	P.c.
Water-free caffeine taken	0.9290	—	—
After heating for 2 hours at 120° . . .	0.9260	0.0030	0.32
" 6 " " . . .	0.9270	0.0230	2.37
" 11 " " . . .	0.8668	0.0622	6.69
" 14 " " . . .	0.8314	0.0976	10.50
" 17 " " . . .	0.7850	0.1440	15.50
" 20 " " . . .	0.7654	0.1536	16.53
" 24 " " . . .	0.7568	0.1722	18.53
" 29 " " . . .	0.7486	0.1804	19.42

5. Caffeine which had been recently sublimed and was consequently anhydrous melted at 231.5° C. and resolidified at 223° C. Strecker gives the melting-point of anhydrous caffeine as 234°, and Biedermann at 230.5°. Mulder gives the melting-point at 177.8°, which is certainly too low.

6. Caffeine which had been recently sublimed and then dissolved in water, alcohol, ether, or chloroform, in each case left the original weight of alkaloid on evaporating the solution and exposing the residue at 100° . The same result was obtained with recently fused caffeine. As caffeine does not lose weight at 100° , and sublimed and fused caffeine are certainly anhydrous, it follows that the alkaloid left on evaporating its solutions in the above solvents is also anhydrous.

7. When a known weight of caffeine was repeatedly treated with a small quantity of water, and the liquid evaporated to dryness at 100° , the original weight was always recovered. When caffeine, previously dried at 100° or 120° , or recently sublimed or fused, was dissolved in 1000 parts of distilled water, the solution concentrated by boiling over a naked flame, and the evaporation completed in a platinum dish at 100° , the residue being finally dried in the water-oven, the weight of alkaloid originally taken was strictly recovered. This proves that caffeine does not volatilise with steam during the evaporation of its solutions, as suspected by some chemists.

Caffeine differs from the great majority of the better-known alkaloids in not containing a pyridine or quinoline nucleus. It has the constitution of a *trimethylxanthine*, $C_7H_4(CH_3)_3N_4O_2$, and in many of its reactions closely resembles xanthine and the allied uric acid. *Theobromine* and *theophylline*, which are isomeric modifications of the lower homologue of caffeine, *dimethylxanthine*, $C_7H_6(CH_3)_2N_4O_2$, have been found in tea, and *xanthine* itself has been isolated from the same source.

Caffeine is very sensitive to the action of alkalies. When warmed for a few hours with dilute caustic soda it assimilates the elements of water and is converted into caffeidine-carboxylic acid, $C_8H_{12}N_4O_3$. This, on further treatment, splits up with great facility into carbonic acid and the strong soluble base *caffeidine*, $C_7H_{12}N_2O$. This again readily suffers decomposition with formation of *methylamine*, *ammonia*, *sarcosine* (methyl-amidoacetic acid), *formic acid* and *carbonic acid*. Thus the following are the stages of the action of alkalies on caffeine:—

a. $C_8H_{10}N_4O_2 + H_2O = C_7H_{11}N_4O \cdot COOH$:—caffeidine-carboxylic acid.

b. $C_7H_{11}N_4O \cdot COOH = CO_2 + C_7H_{12}N_4O$:—caffeidine.

c. $C_7H_{12}N_4O + 5H_2O = NH_3 + 2NH_3 \cdot (CH_3) + C_3H_7NO_2 + CH_2O_2 + CO_2$.

Reaction *b* is realized by boiling caffeidine with baryta water

for half an hour, and *c* when the treatment is longer continued.

Discordant statements have been made respecting the behaviour of caffeine with lime, some observers stating that the action is considerable, while others evaporate tea-infusion to dryness with lime and extract the caffeine from the residue. Our experiments conclusively prove that lime has a powerful action on caffeine, when the treatment is long continued, though the decomposition might not be very serious when a solid substance containing caffeine (*e.g.*, powdered tea) was simply made into a paste with slaked lime and water and the mixture dried.

In order to study the reaction, several experiments on the same lines were made, but the results of one only need be quoted. 1 gramme of anhydrous commercial caffeine was boiled for four hours with 500 c.c. of water and 5 grammes of recently ignited lime in a flask furnished with a reflux condenser.

The contents of the retort were then distilled nearly to dryness, each fraction of 100 c.c. being collected separately. The distillate had no distinct ammoniacal odour, but had an unmistakable smell suggestive of *lobster*. On comparing the odour with that of an aqueous solution of trimethylamine, no marked resemblance was perceptible.

The following were the volumes of decinormal hydrochloric acid required to neutralize the several fractions:—

	Decinormal Acid.
1st fraction of 100 c.c. required	3.7 c.c.
2nd " " " " " "	0.8
3rd " " " " " "	0.6
4th " " " " " "	0.8
5th " " 80 " " " "	1.6
<hr/>	
Total	7.5

After neutralization, the several fractions of distillate were mixed, evaporated to dryness at 100°, and the residue weighed. The weight of hydrochlorides obtained was 0.547 gramme, of which 0.0274 was hydrochloric acid (7.5×0.0365). This leaves 0.0273 for the weight of the bases, and hence the mean combining weight of these was 36.5. Methylamine has the combining weight 31. Hence there is an indication of the presence of a base of higher combining weight, but the quantity obtained is too small to allow of much stress being laid on the result.¹

¹ On distilling the hydrochlorides with slaked lime and water a distillate was obtained which smelt powerfully of lobster and neutralized 6.5 c.c. of $\frac{N}{10}$ acid.

After distilling the contents of the retort nearly to dryness, the residual liquid was filtered hot, the residue washed, and the filtrate and washings concentrated and shaken with chloroform as long as anything was extracted. The separated chloroform left on evaporation a residue of 0.4289 gramme of unchanged caffeine. The aqueous liquid was made acid with oxalic acid, the precipitated calcium oxalate filtered off, and the filtrate and washings agitated with chloroform. Only 0.0002 gramme of caffeine was thus recovered.

The residual lime from the experiment was treated with hot oxalic acid solution, the liquid filtered, and the filtrate and washings concentrated and shaken with chloroform, which on evaporation yielded an additional 0.0024 gramme of caffeine.

Thus there was recovered a total amount of 0.4315 of caffeine out of 1 gramme taken. The volatile bases formed represent an additional 0.0485 gramme¹ decomposed in accordance with reaction C., leaving 0.5200 gramme unaccounted for, but presumably converted into cafeedine or cafeedine-carboxylic acid according to reaction *b* or *a*.

In other experiments the boiling with lime or magnesia under a reflux condenser has been omitted, 1 gramme of caffeine being simply distilled with 500 c.c. of water and 5 grammes of lime or magnesia. The following results were thus obtained:—

	With slaked Lime.	With ignited Magnesia.	With ignited Magnesia.
1st 100 c.c. distillate	0.25 c.c.	0.40 c.c.	0.30
2nd " "	0.15 c.c.	0.10 c.c.	0.20
3rd " "	0.10 c.c.	0.10 c.c.	0.15
4th " "	0.15 c.c.	none	none
5th 80 c.c.	0.40 c.c.	none	none
Total N acid required=	1.05 c.c.	0.60 c.c.	0.65
Caffeine recovered from contents of retort	0.5512	—	0.9734

In each of these experiments the distillate had an odour of lobster. In the case of lime it will be observed that nearly half the caffeine was decomposed, though reaction *c* occurred only to a trifling extent. With magnesia very slight decomposition of the caffeine occurred, and the formation of volatile bases soon came to an end. This is difficult to explain if they owed their formation

¹ In another experiment volatile bases were obtained corresponding to upwards of 20 per cent. of the caffeine taken.

to the decomposition of caffeine itself, since there was abundance of it undecomposed and a large excess of magnesia present. It seems more probable that when magnesia is employed what really suffers decomposition is some impurity present in the commercial caffeine.

That this is the true explanation is more probable from the fact that when commercial caffeine is purified by solution in water, and extraction by chloroform, it yields only an insignificant trace of ammonia or other volatile base on distillation with magnesia and water, and the distillate has not the odour of lobster.

Caffeine is well known to be practically neutral to litmus, and has no alkaline reaction to phenolphthalein. To methyl-orange, however, I have proved it to be distinctly alkaline, though under the conditions of my experiments only about 5 per cent. of the sulphuric acid theoretically necessary to combine with the alkaloid sufficed to produce an acid reaction. This result was of course due to the well-known ease with which the salts of caffeine undergo decomposition into free acid and alkaloid in presence of water, a tendency to which the indefinite nature of the official citrate of caffeine is also due.

None of the compounds of caffeine are sufficiently stable or insoluble to be of service for the separation or precipitation of the alkaloid, which is always determined by weighing it in the free state. The *isolation* of caffeine presents no difficulty, and may be effected by a variety of methods. The majority of these depend on the treatment of the substance or its aqueous infusion with lime, magnesia, litharge, or basic lead acetate, to render the tannin insoluble, and crystallisation of the caffeine from the concentrated filtrate, or extraction of it by benzene, ether, or chloroform. To insure the absence of inorganic salts, the alkaloid should be sublimed or shaken out from its aqueous solution by chloroform. Provided that the caffeine isolated be well crystallised, colourless, free from acid or alkaline reaction to litmus, completely soluble in chloroform, and leaves no ash on ignition, it may be regarded as pure.

Although the *isolation* of caffeine in a state of absolute purity may be easily effected, the accurate *determination* of the proportion of alkaloid present, especially in tea, is attended with great difficulty, and hence most of the published results represent the proportion of caffeine *isolated* rather than the amount *existing* in the substance examined. When once in solution several methods may be used, though even in this case some of the published

processes give results which are enormously wide of the truth. As a consequence, the great majority of the published determinations of caffeine are completely worthless, and even where a number of figures have been obtained by the same process they probably do not bear any relation to each other.

The determination of the alkaloid in tea has recently been the subject of a very large number of experiments in my laboratory, and the following facts have been fully established :—

1. Aqueous solutions of caffeine, even when very dilute, may be concentrated by boiling, and subsequently evaporated to dryness at 100° without the least loss of alkaloid.

2. Caffeine cannot be estimated, even approximately, by crystallisation from water, the amount remaining obstinately in solution, in the presence of saline matters, often exceeding that which can be separated as crystals.

3. Caffeine can be completely extracted from its acidulated or slightly ammoniacal aqueous solutions by repeated agitation with chloroform. In the author's experiments, from a solution slightly acidulated with sulphuric acid the first treatment with chloroform extracts from 70 to 85 per cent. of the total alkaloid. Four treatments with chloroform usually effect the complete extraction of the alkaloid; but it is desirable to agitate a fifth time and evaporate the separated solvent apart, to prove that no more caffeine is being dissolved. In this last case, the solution may be advantageously rendered ammoniacal, or a loss of 0·001 to 0·002 gramme of caffeine may occur, probably owing to the existence of traces of caffeine sulphate, especially where the solution is strongly acidulated with sulphuric acid. On distilling the chloroformic solution of caffeine and drying the residue at 100° C., the alkaloid is obtained in a perfectly anhydrous condition.

4. Pure caffeine is completely unchanged by heating to 100° with strong hydrochloric acid or concentrated sulphuric acid diluted with one-third of its measure of water. On treating the product with water, the whole of the alkaloid may be recovered by agitation with chloroform, as in 3.

5. When a decoction of tea is treated with basic or neutral acetate of lead, a voluminous precipitate is formed. If an aliquot part of the filtered liquid be concentrated and treated with sulphuretted hydrogen, sulphurous acid, sulphuric acid, or sodium phosphate, to remove the excess of lead, and again filtered, the caffeine may be extracted in a condition of perfect whiteness and purity by agitation with chloroform.

6. By prolonged boiling with litharge a decoction of tea becomes completely decolorised, but the process is tedious. If after a time a small addition of lead acetate be made, clarification occurs in a few minutes, and an aliquot part of the liquid may be filtered and treated as in 5.

7. When caffeine is made into a paste with ignited magnesia and water, and the mixture dried at 100° , the original weight of alkaloid can be dissolved out by chloroform; but when powdered tea or tea-extract is substituted for the free caffeine, complete extraction of the alkaloid by chloroform cannot be effected, however carefully the process be conducted, or however prolonged the treatment. This curious behaviour of a dry tea-magnesia mixture with chloroform was first observed by Dr. B. H. Paul and G. E. Scott-Smith. In the case of a mixture of tea with lime about two-thirds, and in the case of tea with magnesia nearly one-half of the total caffeine was found by them to remain undissolved on prolonged treatment with chloroform.

I have fully confirmed the accuracy of the foregoing observation of Messrs. Paul and Smith, which is of great importance, since it invalidates the greater number of the published determinations of caffeine in tea.

The cause of the incomplete removal of the caffeine by chloroform is obscure, and although I have instituted a number of experiments with a view of elucidating it, there are still several points which require examination.

It seemed probable that the difficulty might be caused by the form in which the caffeine existed in tea, and possibly by its association with tannin. In order to simplify the manipulation the following experiments were made on an *infusion* of tea, and hence the question of more or less complete exhaustion of the leaves did not arise at this point. In the first series of experiments decoctions prepared by boiling two separate samples of black tea with water were each divided into two equal parts. One of these was precipitated by lead acetate and the caffeine recovered from the filtered or concentrated liquid by repeated

	Sample A. 30 minutes' boiling.	Sample B. 20 minutes' boiling.
Lead process	3.31 p.c.	2.07 p.c.
Magnesia process, by chloroform . .	1.18 "	0.90
Magnesia process, by alcohol . . .		1.16 } 2.06

agitation with chloroform. The other halves were evaporated to dryness with magnesia, and the powdered residue *thoroughly exhausted* by boiling with chloroform, and subsequently boiled with alcohol.

The following experiments were made at my request by Mr. G. E. Scott Smith:—50 grammes weight of commercial black tea of medium quality was powdered and boiled with water for thirty minutes. The solution was filtered and made up to 1 litre after cooling. Aliquot parts of the solution were then treated in the following manner for the estimation of caffeine:—

A. 100 c.c. (= 5 grammes of tea) was evaporated to a syrup and mixed with 5 grammes of ignited magnesia. The mixture was dried thoroughly at 100°, powdered, and boiled with ether free from alcohol and water.

	Grams.
Caffeine ext. by 6 hours' treatment	0.059
Caffeine ext. by 4 hours' further treatment	0.009
Caffeine ext. by 3 hours' further treatment	0.001
<hr/> Total 13 hours	<hr/> 0.069 = 1.33 per cent.

On subsequently boiling the residue with alcohol, an additional 0.0605 gramme of caffeine was extracted, making 2.59 per cent. in all.

B was conducted like A, but dry chloroform was substituted for ether. The total caffeine extractable by chloroform was 1.54 per cent.

C. Conducted like A, but rectified spirit was employed at once. It extracted 2.81 per cent. of brownish caffeine, which was reduced to 2.78 per cent. of somewhat coloured caffeine by re-solution in water and extraction with chloroform.

D. Conducted like B, but sand was substituted for magnesia. Treatment with dry chloroform extracted successively 0.0365, 0.0175, 0.0135, and 0.0010 grammes of caffeine during nine hours' treatment. On subsequent treatment with alcohol, much tannin and colouring matter was extracted. This was precipitated by lead acetate and the concentrated filtrate shaken with chloroform. Additional yield 0.070 gramme, making a total yield of 2.77 per cent.

E. 100 c.c. (= 5 grammes tea) was heated to boiling, treated with solid lead acetate, filtered, and an aliquot part of the filtrate concentrated and shaken repeatedly with chloroform. Caffeine

recovered was snow-white and equivalent to 2.63 per cent. of the tea.

In the foregoing experiments the residues obtained on evaporating the different solutions were not assumed to be caffeine, but in each case were treated with water, and the alkaloid extracted by repeatedly agitating the liquid with chloroform until exhausted.

The following table epitomises the results of the foregoing experiments :--

	Caffeine found.	Total per cent.
A. MgO mixture extracted by ether	1.38	2.69
MgO mixture subsequently extracted by alcohol	1.31	
B. MgO mixture extracted by chloroform	1.54	2.78
C. MgO mixture extracted by alcohol	2.78	
D. Sand mixture extracted by chloroform	1.37	2.77
Sand mixture subsequently extracted by alcohol	1.40	
E. Infusion precipitated by lead acetate, and concentrated filtrate extracted with chloroform	2.63	2.63

Why only a portion of the caffeine should be dissolved by ether or chloroform from a mixture of tea-extract with sand or magnesia is not evident, as in every case the treatment was continued as long as anything was dissolved by the solvent. Subsequent boiling with alcohol removed the remainder of the caffeine, but by no means readily; many hours' boiling and the use of fresh quantities of alcohol being necessary to ensure perfect solution.

It seemed probable that the difficult or incomplete solubility of caffeine observed in the foregoing experiments might be due to its association with tannin, or possibly to its partial existence in some more complex form of combination, such as a glucoside, undergoing gradual decomposition by boiling water or alcohol. This conjecture receives some support from the recent researches of E. Knebel (*Apoth. Zeit.*, 1892, vii. 112), who states that the caffeine of the kola-nut exists as the glucoside *kolanin*, which on boiling with water and treatment with dilute acids splits up into caffeine, glucose, and kola-red.

In order to ascertain whether the presence of tannin was the cause of the anomalous behaviour of caffeine with solvents, some experiments have been made by adding known quantities of caffeine to an aqueous solution of a large excess of gallotannic acid. Aliquot parts of the liquid were then evaporated to dryness with magnesia, sand, etc., and the dry mixtures exhausted by boiling with solvents. The results showed that while chloroform

failed to extract the whole of the caffeine from the dry mixtures, alcohol likewise failed to dissolve all the alkaloid, though it dissolved much more than chloroform.

This result was so remarkable and unexpected that we next prepared tannin by precipitating a hot decoction of tea with lead acetate, filtering, thoroughly washing the precipitate with hot water, decomposing it with sulphuretted hydrogen, and concentrating the filtered solution. To aliquot portions of the tannin solution thus prepared definite quantities of caffeine were added, and the liquids evaporated with sand or magnesia, and treated with solvents as before. The results again showed conclusively the impossibility of dissolving the whole of the alkaloid by chloroform. In addition it was found impossible to extract the whole of the alkaloid by alcohol, from 10 to 15 per cent. of the total being permanently retained by the mixture. Every opportunity was given to the magnesia to react with and decompose the tannate of caffeine, but no better result was obtained.

These results require extension and verification in certain directions, but they absolutely invalidate the numerous published determinations of caffeine, in which the alkaloid is dissolved by chloroform, ether, or benzene, from dried mixtures of tea-extract with sand or magnesia, or both. They further throw suspicion on Paul and Cowley's method, in which the powdered tea is made into a paste with lime or magnesia and water, and the caffeine extracted from the dried mixture by means of alcohol. Complete extraction appears to be sometimes attainable; but that it occurs with extreme difficulty is quite certain. A similar obstinate retention of caffeine is admitted by Würthner, who states that ether only takes up the caffeine (from an infusion of tea evaporated with magnesia) very slowly, and after long and repeated maceration. He believes inattention to this point is the reason why determinations of caffeine by the Mulder process and its modifications have given such low results, compared with other methods. He recommends that the magnesia residue should be macerated with 150 c.c. of ether *for three days*, with frequent shaking, the ether filtered off, the residue again macerated for twenty-four hours, and the exhausted substance washed with ether. For the complete extraction of the caffeine from 5 grammes of tea about 300 c.c. of ether is required.

A process which requires such prolonged treatment and enormous quantity of solvent to extract an easily soluble substance is evidently ill-fitted for its purpose.

The foregoing experiments relate to the extraction of caffeine from the decoction or extract of tea; but when tea itself is employed, the additional difficulty of effecting complete solution of the alkaloid is met with.

The obstinacy with which a portion of the caffeine is retained by tea-leaves, even when finely powdered, suggests its occurrence in some form far less soluble than the tannate, which dissolves tolerably easily in boiling water. In order to study the rate of extraction, powdered black tea, of medium quality, was treated with hot and cold water, when the following results were obtained:—

Caffeine extracted by cold water.		Caffeine extracted by boiling water.	
	Per cent.		Per cent.
In 3 days	1·81	In $\frac{1}{2}$ hour	2·46
" additional 2 days	0·29*	" additional 2 hours	0·72
" " 2 days	0·70*	" " 4 hours	0·16
" " 6 days	0·22	" " 6 hours	0·01
" " 6 days	0·13		
Total in 19 days	3·15	Total in 12 $\frac{1}{2}$ hours	3·35

Thus the extraction of the caffeine by boiling water was practically complete after six hours' treatment; while with cold water the total amount was not dissolved after nineteen days' treatment.

In both the hot and cold water experiments, the infusion reduced Fehling's solution after removal of the tannin by lead acetate. The caffeine did not reduce the copper solution either before or after boiling with dilute acid.

On the supposition that the cellular structure of tea is the cause of the obstinate retention of the caffeine, E. Zöller (*Zeitsch. Anal. Chem.*, xii. 106) has proposed to treat the finely powdered tea with strong sulphuric acid diluted with one-third of its measure of water, and heat the mixture at 100°, till the cells are thoroughly broken up. Some water is then added, an excess of hydrated oxide of lead stirred in, and the mixture dried and exhausted with alcohol of 86 per cent. The alcoholic solution is decolorised with animal charcoal, and evaporated, till caffeine crystallises on cooling. From the mother liquor, the residual caffeine is extracted by ether. Zöller obtained the high proportion of 4·94 per cent. of alkaloid from a high quality of Himalayan tea, in addition to a small quantity of what was apparently theobromine. Messrs. C. and G.

* These two figures have not been transposed.

Caines have made in my laboratory a large number of experiments on the lines of Zöller's process, modified in various manners; but chiefly through the remarkable persistency with which caffeine is absorbed and retained by the carbon formed by the acid treatment, they have not hitherto resulted in the evolution of a practical analytical method.

On treating powdered tea with slightly diluted sulphuric acid, and heating the mixture in the water-oven for an hour or two, a black product is obtained which powders readily. On boiling this product with water, a perfectly colourless solution is obtained, from which, after concentration, perfectly colourless caffeine may be extracted by agitation with chloroform, either with or without previous removal of the sulphuric acid by boiling with litharge or white lead, or neutralisation with ammonia. The fact that a colourless liquid is obtained on treating the charred tea with water is due to the absorption of colouring matters by the finely divided carbon formed. Unfortunately, this product also takes up a considerable proportion of the caffeine, and retains it with such obstinacy that it is only extracted by prolonged and repeated treatments with alcohol. Although the entire amount present is ultimately obtainable in solution, the extraction is too uncertain and tedious to render the method a desirable one in practice. Exhaustion direct with alcohol, ether, chloroform, benzene, or water, either with or without previous neutralisation of the acid with litharge or magnesia, equally failed to ensure ready extraction. Of the numerous experiments made in this direction the following may be mentioned:—25 grammes of ordinary black tea of medium quality was finely powdered, and treated with 10 c.c. of sulphuric acid, diluted with one-fifth of water. The mixture was heated at 100°, treated with a little water, and ground with excess of litharge until neutral. The mixture was re-dried and thoroughly exhausted successively in a Soxhlet tube with boiling rectified spirit, boiling proof spirit, and boiling water. The solutions were evaporated and the caffeine extracted by repeated agitation with chloroform. The following were the results obtained:—

	Yield of Caffeine.
By strong alcohol (sp. gr. '838)	3·03 per cent.
By subsequent treatment with proof spirit	0·50 "
By subsequent treatment with water	0·21 "
Total	3·74

The caffeine isolated was snow-white. These results show that

the alkaloid is unaltered by the treatment, and if extraction could be effected with certainty by a single solvent, the process would possess marked advantages. Substitution of magnesia for the oxide of lead, and various other modifications of the details, equally failed to give a satisfactory result. Nor was complete extraction effected when the mixture was actually boiled with the solvent instead of being treated with it in a Soxhlet tube.

As the result of experiments numbering several hundred, executed at my request by G. E. Scott-Smith, C. M. Caines, and G. F. A. Caines, I prefer the following method of determining caffeine in tea. It closely resembles a process employed by Stahlshmidt (*Chem. Centralblat*, 1861, 396).

Six grammes of finely powdered tea is treated in a flask with 500 c.c. of water, which is then kept boiling under a reflux condenser. No Soxhlet extractor or similar arrangement is so effective or rapid as actual boiling with water. Alcohol effects no quicker or better extraction than water, and has the disadvantage of dissolving chlorophyll.¹ After six or eight hours' boiling the decoction may be filtered, the residue washed on the filter, and the filtrate made up with water to 600 c.c. It is then heated nearly to boiling, and about 4 grammes of acetate of lead in powder added, a reflux condenser attached, and the liquid boiled for ten minutes. If on removing the source of heat the precipitate does not curdle and settle readily, leaving the liquid colourless, or nearly so, a further addition of lead acetate must be made, and the boiling repeated. When clarification is effected, the liquid is passed through a dry filter. 500 c.c. (5 grammes of tea) of the filtrate is then evaporated to about 50 c.c., when a little sodium phosphate is added to precipitate the remaining lead. The liquid is filtered, the precipitate washed, and the filtrate further concentrated to about 40 c.c., when the caffeine is extracted by repeated agitations with chloroform, at least four treatments with which are necessary to ensure the complete extraction of the alkaloid. The separated chloroform solutions are mixed and distilled in a tared flask immersed in boiling water. The last traces of chloroform are removed while the flask is still hot by a current of air, and the residual alkaloid is weighed. The caffeine thus isolated is snow-white in colour, neutral in reaction to litmus, and completely volatile and soluble in water. It does not reduce Fehling's solution either before or after boiling with dilute acid.

¹ Dilute hydrochloric or sulphuric acid gives no better result than water, and alkaline solutions extract too much colouring matter.

As a precaution, the exhausted tea-powder should be again boiled with water, and the decoction treated as before. When experience has proved this to be unnecessary, the process can be shortened by boiling the tea with 600 c.c. of water in the first place, and adding lead acetate without previously filtering from the exhausted tea. In some cases it is *necessary* to adopt this modification, owing to the extreme slowness with which the unclarified decoction filters.

As a rule, the concentrated filtrate from the lead precipitate separates readily from the chloroform after agitation; but occasionally an obstinate emulsion is formed. Should this occur, the best plan is to wash the contents of the separator into a flask, distil off the chloroform, treat the remaining liquid with a few drops of basic acetate of lead, filter, and shake the filtered solution with chloroform, as before. The basic acetate precipitates and removes certain colloid matters which emulsified the chloroform.

By the foregoing method of precipitation of the tea decoction with neutral lead acetate, and extraction of the caffeine from the concentrated filtrate by agitation with chloroform, Messrs. C. M. and G. F. A. Caines have recently obtained the following results. The total caffeine was determined in the decoction obtained by boiling the finely powdered tea for six hours with water. In some instances the caffeine dissolved by thirty minutes' boiling was also determined. The figures refer to the moisture-free tea in each case.

Description of Tea.	Caffeine per cent.	
	30 minutes' boiling.	6 hours' boiling.
Assam whole leaf (Pekoe)	—	4.02
Assam broken leaf	—	4.02
Ceylon whole leaf (Pekoe)	3.40	3.85
Ceylon broken leaf	—	4.03
Java Pekoe.	—	3.75
Kaisow Red leaf	—	3.41
Moning Black leaf	3.44	3.74
Moyune Gunpowder	2.76	2.89
Natal Pekoe-Souchong	2.85	3.08
Medium black teas	—	3.6 to 4.2

The specimen of Natal tea is interesting as being a sample from the first parcel ever imported into England. It gave the following analytical results :—

Water	8.36 per cent.
Insoluble matter	51.96 "
Hot water extract	39.68 "
Tannin (by PbA_2)	8.33 "
Caffeine	2.85 "
Total ash	6.14 "
Soluble ash	3.56 "
Alkalinity (K_2O) of soluble ash	1.15 "

I have to express my thanks to Messrs. C. M. Caines, G. F. A. Caines, and G. E. Scott-Smith for their very able assistance in carrying out the numerous experiments connected with this investigation.

The PRESIDENT said he should like to ask Mr. Allen if he had any grounds for the idea that this alkaloid might exist as a glucoside, and if so, whether the addition of a little acid might not increase the yield?

Dr. B. H. PAUL said the subject of this paper was of some interest, although not altogether of a pharmaceutical nature. He had paid attention to it several years ago, and to a certain extent he could confirm some of the statements made by Mr. Allen. In regard to the suggested difference between the physiological action of caffeine and theine, Mr. Allen seemed to be under a mistake as to what had taken place. That suggestion was based on a very slender observation made by Dr. Lauder Brunton and Professor Cash, which had never been properly followed up, so far as he was aware. Certain physiological indications were observed which they thought tended to show that caffeine and theine might be distinct substances, but there was some uncertainty as to the origin of the caffeine, and he (Dr. Paul) had provided Dr. Brunton with a quantity of caffeine really made from coffee, but he had not heard of any result having been arrived at. As the members were aware, caffeine or theine had for a long time been made exclusively from tea; the quantity present in coffee being so small, and the labour involved in extracting it being considerable, nobody ever thought of making caffeine from that source. It was merely a conjecture, therefore, as to there being any chemical or physiological distinction between theine and caffeine. With regard to the chemical behaviour of caffeine, Mr. Allen was quite right in saying that it might be dried at a temperature of 100° with perfect safety. It remained perfectly constant in weight for practically any length of time at that temperature. They were no doubt conditions under

which caffeine could be sublimed, but they were such as any careful analyst would studiously avoid, and therefore they need not be considered then. As to the action of lime and the alkalies, especially baryta, it was perfectly correct and well known that caffeine might be decomposed; baryta did it readily, and the caustic alkalies, potash and soda, did so to some extent; probably lime might be got to do it if you went out of your way to produce decomposition; but in the analysis of tea no sane person would attempt to boil it with lime. He would use the lime in such a way as to do the work he wanted done—eliminating the theine and getting it in such a state that it could be extracted from the rest of the material without being decomposed. That might be done perfectly by following the simple plan he long ago indicated, of mixing the powdered tea with hydrate of lime, moistening the mixture with a little water, drying at a gentle heat, and then submitting it to extraction. In that way he had no hesitation in saying there was no decomposition of the caffeine. The whole of it could be got out, but to accomplish this you must use the proper solvent. Ether would not do, and chloroform would not do. His experiments published some years ago showed that a mixture of lime and tea could not have the whole of its theine extracted by any amount of boiling with chloroform, however often repeated or long continued. But with alcohol you could get out the whole, and the amounts of theine obtained from different kinds of tea in that way were considerably in excess of any previously published results. Mr. Allen spoke of some experiments in which he treated commercial caffeine and found that there was a certain amount of decomposition, produced by treatment with lime, and slightly also with magnesia.

Mr. ALLEN said he referred to boiling with lime-water for some hours.

Dr. PAUL said he understood Mr. Allen to say there was some partial decomposition, and that it might be due to the presence of an impurity.

Mr. ALLEN said that was with magnesia.

Dr. PAUL said the statement left some uncertainty whether it was caffeine or the impurity that was decomposed. If it was not caffeine the decomposition would be advantageous for the determination of caffeine, but if it was caffeine he should say that the mode of operation was unsuitable. If it were only an impurity that was decomposed, the sooner it was got rid of the better. With regard to the salts of caffeine, Mr. Allen spoke of citrate of

caffeine as a mixture, but that opinion was in direct opposition to established facts. Caffeine citrate was as much a salt as any other, but it readily underwent dissociation when dissolved in water. That was the only difference between it and other salts. Mr. Allen had also referred to the hydrolysis of caffeine and its decomposition in that way when speaking of his attempts to determine it by titration. To apply any method of titration for the determination of caffeine was, however, altogether out of the question. Mr. Allen said you might determine 5 per cent. of the amount by means of titration reagents; but if 95 per cent. was not determining, the method was of no use. He had never heard that caffeine underwent hydrolysis by boiling with water; that statement was quite a novelty, but he doubted whether it was correct. With regard to the method of analysis, Mr. Allen seemed to indicate that he preferred to extract theine from tea by making an infusion or water extract with the tea; but neither infusion nor decoction with water would take out the whole of the theine. Then he said, when you had the extract, you could operate upon it with lime; but he (Dr. Paul) should say, when you had got the extract, throw it down the sink, because it would not contain all the theine. Peligot's method was open to the same objection. If you started by making an infusion, the whole of the theine would not be got out; and that was what you wanted to determine. Mr. Allen said that the method was more certain, but he should say its only certainty would be that of producing an erroneous result. As to the state in which caffeine existed in tea, causing the difficulty in extracting it, his opinion was not very definite; but as a result of his experience the conviction in his mind was that a large portion of the caffeine existed in a state very similar to that of the colouring material in a lake; some of it at any rate was very intimately associated with the astringent substance, and there was a great difficulty in separating it. From the general impression produced by the statements in Mr. Allen's paper, it appeared to him that what was true was not new, and what was new was not true.

Mr. T. F. ABRAHAM asked how it happened, if caffeine were the active principle of tea, that the universal experience of users of tea throughout the world was that a few minutes sufficed to extract the virtue of tea, while Mr. Allen spoke of the necessity of treating the tea for hours in order to extract the active principle. Why should one portion of the active principle require hours for extraction, while the general verdict of mankind was that it could

be practically exhausted in a minute or two. Was it not more reasonable to suppose that there were really two principles; had it really been shown that that which took hours to extract was the same as that for which the Chinese and all the great tea users considered three minutes sufficient. In fact, one minute was enough if the tea were previously damped. There was one process for making tea in which the leaves were uncurled by a few drops of water, and then boiling water poured on, and you instantly got a most refreshing infusion.

Mr. CLAGUE thought the last speaker had rather missed the point. He always understood that in the making of tea a short infusion was adopted in order that some undesirable matters should be kept out, rather than that a complete extraction of the caffeine present should be obtained. He quite agreed that a very refreshing beverage, and very strong in its effects, could be obtained by a short infusion, and he had several times tried an experiment on himself of this kind. He had taken the quantity of caffeine supposed to be found in a given quantity of tea, and not found that he obtained any physiological effect at all commensurate with taking an infusion—even though a short one—of the like quantity of tea. Possibly the tannin principles which did not readily yield to infusion in boiling water, but which came out afterwards and spoiled the tea, might hold back the caffeine to the small extent that Mr. Allen and Dr. Paul spoke of; and would it not be possible to split up that tannin by something like a process of fermentation, and so get out all the caffeine with a comparatively short infusion.

Mr. GERRARD, referring to the statement that caffeine had not an alkaline reaction, said his experience recently with three samples—one from the dispensary, and two from other sources—was that if a piece of red litmus paper moistened with water had a few crystals of caffeine applied to it, it showed a faint alkaline reaction. He was aware of the fact that you might take a gramme or two of caffeine and just moisten it with water, and adding a very small quantity of acid, you at once got an acid reaction, but that did not alter the fact he had mentioned. Another point which attracted his attention was the process Mr. Allen had mentioned of using acetate of lead to precipitate the colouring matter, and then adding phosphate of sodium to precipitate the lead. In that case, of course, there would be some acetate of lead formed, and he thought he understood that acetate of sodium, and similar salts, were obstacles to the extraction of caffeine.

Mr. ALLEN said they were obstacles to its crystallisation from water, but did not interfere with its extraction by chloroform from the aqueous liquid.

Mr. GERRARD concluded by saying that he was much interested in this communication. There were some remarkable points about it which had been referred to by Dr. Paul and others, especially the obstinacy with which this base attached itself to various substances, and he failed to see any satisfactory explanation of that fact.

The PRESIDENT said caffeine was described in the Pharmacopœia as neutral to litmus. He would suggest whether, after all, the simplest view—and he had heard nothing to-day against it—was not this: that a portion of the caffeine existed in the tea in a free state, and came out in the first minute or two of the infusion, while the rest of it was in combination with the tannin, and could not be got out so easily.

Mr. MARTINDALE said he agreed with Mr. Allen's protest against the so-called citrate of caffeine of the Pharmacopœia. In any revision of the Pharmacopœia he trusted they would have a more definite salt than that which was so described, and was merely a mixture. As generally sold in commerce, it was simply equal weights of citric acid and caffeine, without the details of the B.P. process being followed. Other salts could be made, especially the hydrobromate, which was a definitely crystallisable body, and was a good deal in demand at the present time.

Mr. ALLEN, in reply, said he feared his case had somewhat suffered from his having given his paper in abstract. With regard to citrate of caffeine, Dr. Paul said it was wrong to call it a mixture; there was a definite citrate, just as definite as other salts. He never disputed that. His point was, in which Mr. Martindale had confirmed him, that the B.P. product was an uncertain mixture; and if Dr. Paul wished any further information on the subject, he would refer him to the *Pharmaceutical Journal*, vol. xix., p. 252, where he would find that the B.P. article is generally regarded as an indefinite, unstable, inaccurately described, and superfluous preparation. He had not suggested that a titration of caffeine could be made by the aid of methyl-orange; but had simply stated a fact not previously recorded, that caffeine was alkaline to that indicator. Similarly, his paper contained no suggestion that caffeine was susceptible of hydrolysis, but Dr. Paul and he agreed that salts of caffeine underwent dissociation very readily by the action of water. Dr. Paul very properly

suggested that if magnesia had a decomposing action on the associated impurity it was desirable to use it, but he rather overlooked the fact that his (Mr. Allen's) experiments were made with the view of studying caffeine and its behaviour under various circumstances. How could he be sure that caffeine would resist the action of magnesia until he tried, and when he found that commercial caffeine did give these results he attributed it to impurity, but never suggested that that was an objection to the use of magnesia in the process of estimating caffeine on the ground of its decomposing the alkaloid. Of the safety in using lime he was less certain, though of course the tendency to decomposition was far less than in the experiments he had described. Chemists were not agreed as to the behaviour of caffeine with lime, and his experiments were made to ascertain the truth, and the conditions of working were purposely chosen so as to obtain an extreme effect, the better to study the change. On one point they were directly at issue. Dr. Paul said if you boiled tea with water you could not get out the whole of the caffeine, but where was the proof of that?

Dr. PAUL said it was published three years ago.

Mr. ALLEN said he was very familiar with Dr. Paul's writings on this subject, but did not find there any proof that water would not remove the whole of the caffeine from tea. He found the statement, but no experiment in proof of it. All he could say was that he went on boiling with water until he could get no more caffeine out, and that was the only proof he had that he had got it all out; it was not entirely logical, for some might still have stayed behind, but it was exactly the means by which Dr. Paul assured himself of the complete extraction of a tea-lime mixture by means of alcohol. Unless Dr. Paul could take the exhausted leaves after they yielded no more caffeine to water, and by some other process get out a further quantity of caffeine, he should assume there was complete extraction.

Dr. PAUL said if Mr. Allen would put the leaves into a percolator with lime and boil with alcohol, he would obtain more caffeine.

Mr. ALLEN said that, on the contrary, he obtained somewhat more caffeine by the process to which he gave the preference than by Dr. Paul's method; though many of the experiments were made by the same gentleman (Mr. G. E. S. Smith) who had previously worked the process with Dr. Paul. Much depended on the length of time the tea was boiled with water. In the case of a

sample mentioned in his paper he found that with boiling water 2·46 per cent. came out in half an hour. That was very different to a few minutes; but he was working for chemical results and absolute amounts, not for the quantity which happened to go into an infusion in five or ten minutes, as to which there were a number of good analyses. There were a large number by American chemists. In half an hour 2·46 per cent. of the caffeine was extracted, and in another two hours a further ·72 per cent.; in an additional four hours ·16 per cent., and in another six hours ·01 per cent. Therefore there was a very trifling extraction practically after six hours, when he had got out all that would come out; he would not say all that was there. Working with cold water he had to go on for nineteen days, and did not get out quite so much as in six hours with boiling water. He thought he had spoken of Dr. Paul's process as being the only one at all reliable, but he was not sure that it extracted the whole of the caffeine from tea-dust or tea-extract with lime or magnesia. His difficulty was that when he performed the process on a mixture—not tea—containing a known amount of caffeine and tea tannin, he could not get out the whole of the caffeine. He could obtain the remaining 10 per cent. afterwards by dissolving it in water, removing the colouring matter with acetate of lead, and shaking out the caffeine from the concentrated filtrate with chloroform. He was therefore at issue with Dr. Paul on that point. He thought his process was good up to 90 per cent., but for the last 10 per cent. it failed. It was most difficult to understand why it should fail to that extent; why there should be one portion extractable with one solvent and another with another. It might be that there were two forms, one a glucoside and one free; but there was enough tannin in the tea to combine with all the caffeine, and therefore it was not very intelligible. He had boiled tea with dilute sulphuric acid and with hydrochloric acid; in fact, he had tried everything that occurred to him, and tried all he knew to obtain a better result than six hours' boiling with water, but could not succeed. He got a somewhat higher result in that way than by any other method, including the process recommended by Dr. Paul. When he operated on a known amount of caffeine in admixture with tannin and magnesia, and found that the whole of the alkaloid could not be extracted by chloroform or ether, nor even by alcohol, it went to show, at any rate, that there was something about it which was not yet understood. He could not therefore agree that that which was new, as these experiments were, and which had not been already pub-

lished by Dr. Paul, was not true, and should continue to place confidence in his results until they were disproved.

A vote of thanks was accorded Mr. Allen for his paper.

The next paper read was entitled—

TESTS FOR THE PURITY OF CHLOROFORM.

By DAVID BROWN, F.C.S.

The term purity is not employed in its absolute sense, but rather to denote that degree of it to which imperfect man may, with his surroundings, be reasonably expected to aim at and reach. Chloroform impurities generally exist in the form of substances termed "Chlorinated compounds," and are either produced with the chloroform during its preparation, or are derived from the decomposition of chloroform itself. No exhaustive examination of them has yet been made.

Fatal accidents during the administration of chloroform are variously ascribed to impurity in it, to an overdose, to an underdose, and to some fatal susceptibility in the patient which cannot be previously discovered. Whatever be the cause, I think chloroform intended for anæsthetic purposes should be as free from impurity as it is possible to make it. The B.P. tests were no doubt at the time of their selection (and for some time afterwards) considered sufficiently stringent, but it is now well known that preparations which answer these tests contain in many cases considerable quantities of removable impurities, and further, that there are no official standards by which they can be condemned because of this; it is therefore necessary to provide higher standards capable of meeting the higher requirements. For some time I have been working in this direction, and have come to the conclusion that the acid and bad smell tests of the B.P. are the only ones which require alteration in order to adapt them to the present requirements. The principal objections I have to them are that no fixed quantities of acid and chloroform are given in the former, and that in the latter "a few drops" are not enough to enable the average examiner to arrive at correct conclusions—the impurity in a sample may be so small that no colour is imparted by it to fifty or one hundred per cent. of acid, but it might be sufficient to impart a distinct colour to say ten per cent.; in

like manner the nose of an expert may fail to find impurity in "a few drops," when it might be detected in the residue from an ounce or two by a novice. The B.P. tests with the alterations I shall propose, the addition of the zinc iodide and starch test, and a test for the presence of chlorinated products which are decomposed by cold sulphuric acid, would supply the means for subjecting chloroform to a more severe examination than it has hitherto been expected to bear.

I would therefore suggest—

I. That in the acid test the quantity of acid employed be fixed at 10 per cent. of the chloroform used, that it be shaken continuously with it for about twenty minutes, and after the presence or absence of colour is noted, that it be separated, diluted with three volumes of water, and impurities looked for, which are found to manifest themselves by colouring the acid, and by giving off odours foreign to pure chloroform.

II. That the fractional distillation test, described by me in the *Pharm. Journ.* of March 19, 1892, be substituted for the bad smell one of the B.P. By it the sample is carefully fractionated, a residue of 15 per cent. being left, which is slowly evaporated at from 80°–90° F., bad or foreign odours being looked for during and at the end of the evaporation, and the dry non-volatile residue weighed.

III. That zinc iodide and starch be used as a means for detecting the first signs of decomposition, and

IV. That the extent to which sulphuric acid decomposes chlorinated impurities be determined.

Pure chloroform may be shaken with 10 per cent. of sulphuric acid without undergoing decomposition; an impure preparation similarly treated gives decomposition products, which are absorbed by the chloroform, and may be recovered from it by washing with water, and precipitation as silver chloride. It has been stated that these products are not taken up by the chloroform. This is not my experience. I have, with one exception, always found them in the chloroform.

Samples of Scotch, English, and German products have been examined by the above tests, as well as by the present B.P. bad smell test, and the results will be found in the following five tables:—

Table No. I.—B.P. Bad Smell Test.

No. 1	Slight bad smell	} Scotch.
„ 2	No bad smell	
„ 3	No bad smell	
„ 4	No bad smell	
„ 5	Bad smell	
„ 6	Very bad smell	
„ 7	No bad smell	} English.
„ 8	No bad smell	
„ 9	No bad smell	
„ 10	Very bad smell	
„ 11	Slight bad smell	
„ 12	Very bad smell	
„ 13	Very bad smell	} German.
„ 14	No bad smell	
„ 15	Bad smell	
„ 16	Bad smell	

(For Tables Nos. II. and III., see pages 440, 441.)

Table No. IV.—Zinc Iodide and Starch Test.

No. 1	no reaction.
„ 2	„ „
„ 3	„ „
„ 4	„ „
„ 5	„ „
„ 6	distinct coloration immediately.
„ 7	no reaction.
„ 8	„ „
„ 9	„ „
„ 10	„ „
„ 11	„ „
„ 12	„ „
„ 13	„ „
„ 14	„ „
„ 15	„ „
„ 16	„ „

Table No. II.—*Modified Acid Test.*

No.	Colour of Acid.	Colour of Diluted Acid.	Odour of Diluted Acid.
1	Distinctly darkened	Faint pink	Strong pine odour.
2	Pale straw colour	Faint pink	Strong pine odour.
3	Pale straw colour	Faint pink	Strong pine odour.
4	Dark straw colour	Faint pink	Bitter almond odour.
5	Practically no change	Marked pink	Distinct pine odour.
6	Pale straw colour	Marked pink	Faint pine and vinous odour.
7	Practically no change	Very faint trace of pink	Very faint pine odour.
8	Practically no change	Practically no colour	Practically no odour.
9	Distinctly coloured	Faint pink	Distinct pine odour.
10	Yellow colour	Very deep pink	Very strong tarry odour.
11	Pale straw colour	Very deep pink	Faint pine, then fatty acid odour.
12	Dark straw colour	Deep pink	Faint pine, then vinous odour.
13	Pale straw colour	Faint pink	Faint pine, then vinous odour.
14	Very faint colour	No colour	Slight vinous odour.
15	Faint colour	No colour	Strong bad odour.
16	Pale straw colour	Faint pink	Distinct pine odour.

Table No. III.—*Fractional Distillation Test.*

No.	15 Per Cent. Residue.	15 Per Cent. Residue during Evaporation.	Odour of Dry Residue.	1 Part of Residue in Parts by weight.
1	No bad smell	Smoky empyreumatic odour	No smell	777,400
2	No bad smell	Very strong burnt sugar odour	Burnt sugar smell	485,875
3	No bad smell	Very strong burnt sugar odour	Very faint smell	648,700
4	No bad smell	Slight sour smell	Very faint smell	775,840
5	No bad smell	Slight bad smell	No smell	1,297,400
6	No bad smell	Very bad smell	Pineapple odour.	324,850
7	No bad smell	No smell	No smell	1,946,100
8	No bad smell	No smell	No smell	nil.
9	No bad smell	Faint vanilla odour	Very faint smell.	1,000,000
10	Bad creasotic odour	Very bad creasotic smell	Marked bad smell	485,875
11	Cedar wood odour	Very pungent and irritating odour	Faint bad smell	297,200
12	Cedar wood odour	Very pungent and irritating odour	Faint pungent smell	322,400
13	Very bad odour	Very strong wood-tar odour	Not observed	275,786
14	Faint bad odour	Very strong creasotic odour	No smell	486,525
15	Bad odour	Wood-tar odour	Marked bad smell	321,533
16	Bad odour	Creasotic smell	Marked bad smell	202,653

Table No. V.—*Chlorinated Impurities decomposed by Cold Sulphuric Acid, represented as Chlorine.*

No. 1	1 in 159,464
„ 2	1 in 217,452
„ 3	1 in 199,600
„ 4	1 in 29,088
„ 5	1 in 119,760
„ 6	1 in 55,700
„ 7	1 in 399,200
„ 8	1 in 299,400
„ 9	1 in 159,680
„ 10	1 in 22,780
„ 11	1 in 108,072
„ 12	1 in 54,144
„ 13	1 in 297,000
„ 14	1 in 237,440
„ 15	1 in 339,200
„ 16	1 in 13,776

It will be seen from the first table that all the English, one-third of the Scotch, and two-thirds of the German samples have bad smelling residues when “a few drops” are evaporated, which is equal to a rejection of $56\frac{1}{4}$ per cent. of the whole.

In Table II. we find that $81\frac{1}{4}$ per cent. of the samples impart colour to the acid, that there is the same proportion of coloured diluted acids, that all the diluted acids, with one exception, give off odours foreign to pure chloroform; only one sample passes this test, the rejections being increased to $93\frac{3}{4}$ per cent.

Table III. shows that there are $43\frac{3}{4}$ per cent. of bad smelling 15 per cent. residues, $87\frac{1}{2}$ per cent. of all the residues were found, at some stage of the evaporation, to be giving off bad odours, and $67\frac{3}{4}$ per cent. of the dry residue smelt badly, the weight of the dry residues ranges from nothing to 1 part in 202,663 parts by weight. Only one sample passes the test which leaves the rejections as they are in the previous table. It will also be observed that the odours given off are in some cases very much alike, although the chloroform samples are said to have been prepared from different materials. This is very marked in Nos. 2 and 3, and 11 and 12, the first two smelling of burnt sugar, while the others gave off a pungent irritating odour, which produced a copious flow of tears when brought near the eyes.

It will be seen from Table IV. that chloroform in a state of decomposition is not frequently met with.

The results found in Table V. show that all the samples contain

chlorinated compounds, which are decomposed by sulphuric acid; represented as chlorine they give a range of from 1 part in 399,200 to 1 part in 13,776 parts by weight.

The foregoing results show that the tests applied enable us to select chloroform of a very high degree of purity; and they also point out that commercial chloroform is by no means uniform in quality. After my experiments were completed, I observed that Professor Ramsay, in a paper read before the last meeting of the British Association, says he has found carbonyl chloride in many samples of chloroform submitted to him for examination, and recommends baryta water as a test for its presence.

I have tried this test against zinc iodide and starch, and find that under similar conditions baryta water gives a turbidity at once, and that zinc iodide with starch does not indicate correctly until six times more impurity is present than can be detected by baryta water. We must therefore withdraw the zinc iodide and starch test in favour of Professor Ramsay's. A large number of the samples I examined were used up, and I was unable to test them with baryta water; but I have tested others representing fifteen years' production, and find that the older ones stand the test as well as the more recent, which shows that it is not safe to condemn chloroform because of old age.

The PRESIDENT said this subject was very important, particularly in Edinburgh, and Mr. Brown was an authority upon it. They would all agree that the baryta test of Professor Ramsay must be added to the Pharmacopœia. Professor Ramsay found carbonyl chloride in a chloroform which had proved fatal to the patient, and he afterwards made this substance from absolutely pure chloroform, which was carefully tested and boiled to the 100th of a degree, by oxidation. He considered it proved that it was this carbonyl chloride which produced the fatal result by causing closure of the glottis.

Mr. DOTT said the paper required very careful study before one could attempt to criticise it; but with regard to Professor Ramsay's conclusions, he thought it would be very rash to say that chloroform containing a trace of carbonyl chloride was dangerous to use, and it would be interesting to know how Professor Ramsay arrived at that very serious conclusion.

The PRESIDENT said if he remembered rightly Professor Ramsay's statement was founded on the report of a committee.

Mr. MARTINDALE said he believed Professor Ramsay's experiments were carried out on a number of samples of chloroform which had occasioned fatal results, a committee of the British Medical Association having taken up the investigation. He still thought, however, that a number of deaths from chloroform were not due to this cause. A very slight trace of this malodorous body was easily detected by the nose. Undoubtedly the tests of the Pharmacopœia required reconsideration and better definition, and the *baryta water test* should certainly be introduced. Mr. BROWN gave no information as to the amount of alcohol to be added; the German Pharmacopœia said 1 per cent., and so did the British Pharmacopœia, but there was an error there, because it gave the specific gravity as 1.497 instead of 1.488; the higher specific gravity was not possible with the addition of such a quantity of alcohol. It was very awkward when a chloroformist said he had had an accident with the chloroform supplied to him, and asked for an investigation, and chemists should be very careful to see not only that the chloroform was received in good condition, but that it was kept so. It should be kept in bottles as full as possible, and not exposed to the light, which produced decomposition and the formation of those compounds which caused a choking sensation. Chloroform was still more largely used than any other anæsthetic, and any information which would render its administration quite safe would be very valuable, but he feared that danger was inherent in chloroform.

Mr. GROVES said it would be important to know whether the chloroforms tested were prepared by the B.P. process, or one like it, or from chloral. His own opinion was that chloroform prepared extemporaneously from chloral would be far safer than that made by the action of chloride of lime on alcohol. Chloral crystallised readily, and could therefore be readily purified.

The PRESIDENT asked Mr. Brown to state in his reply whether any of the samples tested were made from acetone.

Mr. REYNOLDS said it would also be well to know if methylated spirit were used in making any of the samples examined. It was of considerable practical interest to know whether chloroform made from methylated spirit was as good as that made from pure spirit.

Mr. GERRARD said he believed the manufacturers of this country were using every effort to supply the medical profession with pure chloroform, and he did not think a sample ought to be condemned because it contained .0001 of some other body, which might be

defined as carbonyl chloride, at any rate until it was quite certain that the compound was poisonous. Of course they were always seeking to get absolute purity, but it was well to recognise that it could not be attained. He had examined many samples, and found that if you distilled 200 c.c. the last two or three c.c. of residue contained traces of acetone bodies. But acetone was a simple harmless substance, and he should not think of condemning a chloroform because of a trace of acetone.

Dr. INGLIS CLARK thought Mr. Gerrard's remarks were very well timed. It was high time that chemists and doctors generally should recover from the scare which seemed to have taken possession of them. It would surprise those present to know the statements which were sometimes made. One man would tell you that a sample of chloroform had absolutely no anæsthetic power, the next day he would have the same sample back again, and it would knock a man over almost before he had smelt it, and the next day again it would be pronounced quite inert. When these things were repeated time after time, did it not appear that there must be some other reason besides impurity in the chloroform to account for it? He had read a great deal of correspondence on the subject, and had had samples from all parts of the kingdom returned as being unsatisfactory, and on testing them found they had exactly the power desired. In one case a man had used 4 ounces of chloroform and it had not put the patient over, but 1 drachm of the same article was found perfectly efficacious. Mr. Gerrard said very truly that the aim at *absolute* purity was not necessary, and more than that, it was really tampering with the lives of others, because the more you worked with chloroform to make it pure, the more risk you ran of making it impure. The reason was obvious. Chloroform was a sensitive substance, and if it were heated too long or fractionated often, or treated too frequently with a purifying agent, he did not say it would necessarily decompose, but there was a risk of it. Many thought they were dangerously near the smallest amount of alcohol which could be used with safety, especially considering the varying conditions under which it was kept. He had been into the dispensary of a London doctor, where he saw the chloroform bottle standing on an open shelf, in an outside place like a conservatory, facing the south, with the sun blazing into it. He would prefer to err on the side of making it too safe; what did it matter whether there were 1 per cent. or 2 per cent. of alcohol, it was none the less pure or less efficacious, and he thought if it had 2 per cent. it was

all the better, even though the spec. gravity were 1.490. It should be made pure first, and then enough alcohol added to keep it safely. As to these impurities, it was not a difficult matter for a medical man to obtain them, and try what the real effect was. If a man inhaled 60 minims, how much of these impurities could he have taken, supposing they were present to the extent of 1 part in 10,000? They must be more poisonous than aconitia; he would willingly inhale a drachm of them. There was no proof whatever that carbonyl chloride was the cause of death. No doubt anæsthesia reduced the whole system to such an extent that a little thing upset the balance, and off went the human spirit elsewhere. What was wanted was a little more common sense, and not so much sailing near to the wind.

Mr. MASON said he had yet to learn that the chemist ought to be blamed for accidents with chloroform. He had been told often by medical men that it was only in Scotland they knew how to administer it; but he had learned that morning, much to his astonishment, that coroners' inquests were not required in Scotland. A patient might succumb under chloroform in the Edinburgh Infirmary, and the world know nothing of it; but the same thing could not happen in England. Again, they were sometimes told that English chloroform had certain properties, and Scotch and German other qualities or defects; but he should like to be sure that the German chloroform was not of English manufacture. He noticed that one sample was stated to smell of almonds, and as he believed almond meal was sometimes used as a stopper for the bottles, it occurred to him that the smell might arise from the use of a luting of that nature, rather than from anything in the chloroform itself.

Mr. BROWN in reply said the sample Mr. Mason referred to had no lute of any kind upon it. With regard to carbonyl chloride he could speak from experience as to its irritating properties when inhaled; but he did not think there was much danger of it causing death, because no one using chloroform could fail to have their attention drawn to it, if present. He did not believe either that the so-called impurities were at all fatal. He remembered when a boy going into the still room, seeing the head off the chloroform still which contained impurities, and putting his head over it. He was pleased with the sweet smell, but the next thing he was conscious of was lying on his back outside, and his father pouring water over him and smacking him with a towel. He felt a little squeamish, but was not sick even, and after a night's sleep he was

all right. If these impurities were so fatal, he ought to have died on the spot. The samples examined were made from acetone, alcohol, methylated spirit, and ketones; and the newest sample put on the market, which was said to be the purest, and said to have been made from chloral hydrate, was found to be the most impure of the whole. He believed chloroform could be prepared perfectly pure from any source. The purest sample, the only one which answered all the tests, was made from acetone. He acknowledged the justice of the gravity of 1.497 given in the *Pharmacopœia*, and did not see that it was necessary to reduce it. He had known samples keep for twenty years without any sign of decomposition.

A vote of thanks was passed to Mr. Brown for his paper.

The Conference then adjourned for luncheon.

On resuming, the following paper, in the absence of the author, was read by Mr. Naylor :—

VORTMANN'S TEST FOR HYDROCYANIC ACID.

By H. BOWDEN.

This test seems to have passed entirely unnoticed. It is mentioned in the "Blue List," No. 42, and in the *Year-Book*, 1887, p. 124. G. Vortmann published the test in *Monatshefte für Chemie*, vii. 416, 417.

It consists in mixing the suspected liquid with a few drops of a fairly strong solution of potassium nitrite and 3 drops of a solution of ferric chloride; a yellow-brown precipitate is produced. This is dissolved carefully by dilute sulphuric acid, and the mixture boiled and then cooled; ammonia is added to precipitate the iron. The mixture is then filtered, and to the filtrate a few drops of a dilute solution of freshly prepared ammonium sulphide added. A violet coloration is produced, turning blue, green, and again violet.

I first made qualitative experiments with acid hydrocyan. dil. One drop was mixed with a few drops of water, and the test carried out as above. I found that at once a fine bright pinkish purple coloration (resembling that of a dilute solution of potassium permanganate) appeared, then a blue coloration lasting from two to three hours, and being succeeded by a green coloration which lasted for

about four hours. This was succeeded by the pinkish purple coloration, which was not quite so deep as the original.

In more dilute solutions I found that the first colour—namely, the pinkish purple—was most distinctly seen, and then the blue less perceptible, the green being scarcely visible.

A sample of dilute HCN was taken, and its strength first determined.

A. Weight of solution of HCN = 6.3955 grammes. Weight of silver cyanide obtained = .5945 gramme; = 1.87 per cent. real HCN in solution.

B. Weight of solution of HCN = 13.2322 grammes. Weight of silver cyanide obtained = 1.224 grammes; = 1.86 per cent. real HCN in solution. Mean = 1.865 grammes real HCN in solution.

These two gravimetric estimations gave closely concordant results, and no more were performed.

This solution, containing 1.865 per cent. real HCN, was used for finding the delicacy of the test.

Experiment α.—2 c.c. of the standard solution of HCN were diluted to 1000 c.c. with distilled water, and 1 c.c. taken and treated by Vortmann's test. *Result*—Deep pink-purple coloration, soon changing to blue most distinctly visible.

Amount real HCN detected = .0000373 gramme.

Experiment β.—1 c.c. of the standard HCN solution diluted to 1000 c.c., and 1 c.c. examined by Vortmann's test gave a most distinct pink-purple coloration; the change to blue being less perceptible.

Amount of real HCN detected = .00001865 gramme.

Experiment γ.—.5 c.c. of the solution of HCN were diluted to 1000 c.c., and 1 c.c. examined by Vortmann's test gave a pale, but very distinct pink-purple colour, changing in a minute or two, the blue coloration not being visible.

Amount of real HCN detected = .000009325 gramme.

Experiment δ.—25 c.c. of the solution of HCN diluted to 1000 c.c. and 1 c.c. taken for examination gave a very faint pink-purple colour vanishing in about one minute, the other colours not being perceptible.

Amount of real HCN detected = .0000046625 gramme.

The last-named amount can be easily detected by those who have performed the test several times, and the amount detected by β, namely, .00001865 gramme HCN, should be detected by any one performing it for the first time.

The test is also applicable to cyanides, but gives better results

when the hydrocyanic acid is free, as a greater amount of nitroprussides (on the formation of which the test depends) appears to take place.

To test for cyanides, therefore, add a drop or two of very dilute HCl, and then proceed as in Vortmann's test.

Sulphuretted hydrogen may be used instead of ammonium sulphide, and, in fact, the test is really the converse of the well-known sodium nitroprusside test for sulphuretted hydrogen.

The delicacy of the test, conjoined with the extreme difficulty of detecting hydrocyanic acid in a poisoned body long after death, would make it worth the while of a toxicologist to experiment with it on the contents of the stomach, etc., of persons poisoned by hydrocyanic acid.

Mr. Bowden was thanked for his paper.

In the absence of the author, the next paper was read by Mr. Ransom.

BARBADOS AND CURAÇAO ALOES.

By E. M. HOLMES, F.L.S.

In "Pharmacographia" it is stated that characteristic samples of Barbados aloes show a "hard dry substance of a deep chocolate-brown, with a clean, *dull, waxy* fracture," but "in small fragments, translucent and of an orange-brown hue." Curaçao aloes is stated to resemble Barbados aloes, but to have "a distinctive odour." Both of these varieties of aloes are affirmed to be the produce of *Aloe vulgaris*, Lam., which was introduced into the West Indies from Asia or Africa in the beginning of the sixteenth century, no aloes being known to be a native of America.

The question then arises, Why are the odours of these two varieties of West Indian aloes different? About three years ago I attempted to solve this problem, and obtained specimens of the aloes and of the aloes plant of the Dutch West Indian Islands, Curaçao, Bonaire, and Aruba, through the kindness of Professor Van Eeden, of Haarlem (*Pharm. Journ.* [3], xx., p. 561). The aloes plant was submitted to Mr. J. G. Baker, of Kew, who is our greatest authority on the aloes group, and he unhesitatingly stated that the plant was *Aloe chinensis*, Baker (*Pharm. Journ.* [3], xxi., p. 205), a plant allied to but distinct from *Aloe vulgaris*. I learned also from Professor Van Eeden that *Aloe spicata* and *Aloe succotrina*

had been introduced into the Dutch West Indies, but appeared to be very rare in cultivation. Two of the specimens of dried aloe juice, sent by Professor Van Eeden, gave to a slight extent the blue reaction with the sulphuric and nitric acid test, characteristic of Natal aloes, but as this reaction is also met with in Jaferabad aloes, which is obtained from an Indian aloe (*Pharm. Journ.* [3], xi., p. 733), this reaction does not prove the presence of the juice of *Aloe spicata* in the aloes prepared in Curaçao. The aloes obtained from Aruba and Bonaire, however, did not give the blue reaction (*Pharm. Journ.* [3], xx., p. 562). Presuming therefore that the reactions obtained by Messrs. Bainbridge and Morrow with these specimens were correct, I arrived at the conclusion that the aloes of Curaçao were probably modified to some extent by an admixture of the juice of the leaves of *Aloe spicata* and *Aloe succotrina*. This conclusion is now disputed by Senor S. C. Henriquez, who manufactures aloes at Curaçao. In March of this year I received from Senor Henriquez, for the Museum of the Society, six specimens of Curaçao aloes, with a letter, from which I extract the following remarks as bearing upon the subject. He writes as follows:—

“I am the party who prepared the aloes upon which you base your opinion. I have carefully compared specimens of the aloe plants of Curaçao, Aruba, and Bonaire, and also of the same plant growing at Coro, a neighbouring place in Venezuela; and could not trace any difference between the several specimens, and I am greatly inclined to believe the statement in ‘Pharmacographia’ that the aloe of Curaçao, Aruba, Bonaire, and Barbados is the same plant. I have made the observation that much depends on the way the juice is treated. It yields a gum like the Barbados at times; at other times like the Cape or ‘Capey Barbados’; and even in some cases a drug almost equal to Socotrine.”

Senor Henriquez then adds information of considerable interest concerning the manufacture of the aloes, which I will give in his own words:—

“By mixing our aloes juice with four times its bulk of water, boiling for a little while, and after cooling filtering it through a funnel, a juice is obtained, which, carefully inspissated, yields a drug of orange colour quite soluble in alcohol and free of all nauseous smell.

“If the juice, without any addition of water, be evaporated, keeping it constantly below boiling point, and allowed to cool, when the moisture has been reduced to 10 per cent., gently stirring

it during the process, and the stuff be cased at a temperature under 100° F., the paste shall be uniform, and after some time become dull. It will lose the original bad smell and become rather aromatic. But if boxed hot the mass will separate, most generally into layers of gum and resin; and it will, moreover, if the heat was excessive at time of boiling, become and remain glossy and adhesive.

"If iron pans are used instead of copper ones, the powder obtained from the drug will have a greenish colour; and if the drug comes in contact with rust and all alkalines be not avoided, a black paste is produced.

"The soil, the season of gathering the juice, and the care in nursing the plant of course are of influence upon the drug.

"The statement of Hanbury that all the West Indies aloes are alike is further evidenced by the fact that in former years, when greater care was bestowed upon the plants and the preparation of the drug, the aloes from Curaçao, Bonaire, and Aruba fetched at one time the same price as the Socotrine, which used to sell at £14 per cwt."

The six specimens sent by Senor Henriquez are labelled as follows:—

1. Evaporated by steam heat below boiling point shortly after the juice had been collected. August, 1891.

2. Evaporated by steam heat beneath boiling point to a little less consistence than No. 1, shortly after the juice had been collected. August, 1891.

3. Evaporated by steam heat beneath boiling point one year after the juice had been collected. August, 1891.

4. Evaporated on a sand-bath beneath boiling point shortly after the juice had been collected. August, 1890.

5. Evaporated on a sand-bath at boiling point shortly after the juice had been collected.

6. Evaporated by steam at boiling point a fortnight after being collected.

The history of these specimens being known thus far, they seemed to offer an excellent opportunity for determining how far the appearance, solubility, and odour of Curaçao aloes are dependent upon the mode of preparation.

With this view, four of the specimens, Nos. 1, 3, 5, and 6, were selected as offering the greatest variation in the processes of manufacture. The physical characteristics of these specimens may be tabulated as follows:—

No.	Colour.	Lustre.	Margin.	Odour.	Colour of Powder.
1	Blackish-brown.	Vitreous.	Translucent.	Between Barbados and Cape aloes.	Bright yellowish-brown.
2	Reddish-brown.	Waxy.	Translucent.	Like Barbados and slightly like Cape aloes.	Dull yellowish-brown.
3	Dull blackish-brown.	Dull resinous, like ordinary Barbados aloes.	Opaque.	Like Barbados but somewhat fruity also, like that of inferior Socotrine aloes.	Dull umber-brown.
4	Reddish-brown.	Between resinous and waxy.	Translucent.	Characteristic heavy, or stramonium-like odour of Curaçao aloes.	Dull yellowish-brown.
5	Blackish-brown.	Vitreous.	Translucent.	Like Barbados and slightly like Cape aloes.	Dull yellowish-brown.
6	Blackish-brown.	Vitreous, with many minute vesicles.	Translucent.	Between Barbados and Cape aloes.	Yellowish-brown, with a tinge of red.

All of these specimens except No. 3 present the appearance known as "Capey" Barbados, that is, they possess the distinctive odour and conchoidal fracture of Barbados aloes, but have the vitreous lustre of Cape aloes.

It is from this table evident that the aloe juice, if evaporated below the boiling point and by the aid of steam heat, yields the "Capey Barbados," or fine quality of Curaçao aloes, of commerce, which affords a powder of good colour, but that if kept for a year and then evaporated, as in the case of No. 3, it affords an opaque aloes with a dull surface, and acquires (probably by fermentation) an additional odour recalling that of butyric ether. It affords a brown, and not a bright yellowish-brown powder. The use of a steam or sand-bath does not seem to cause much difference in the colour of the powder or of the aloes.

I have further examined these specimens of aloes to determine how far the percentage yield of aqueous extract would be affected by the method of manufacture adopted. The experiments having this object have been carried out in the Laboratory of the Pharmaceutical Society, by the kind permission of Dr. Attfield, and with the help of Mr. H. D. Fuge.

The results I obtained were as follows:—

No. 1	.	.	.	.	.	78.7	per cent.
" 3	.	.	.	.	.	69.35	"
" 5	.	.	.	.	.	73.07	"
" 6	.	.	.	.	.	82.6	"

When the aloes were dissolved in boiling water, 1 part in 10 (according to the British Pharmacopœia proportions), in no case was a clear solution obtained, but a turbid one, Nos. 1, 5, and 6 being of an opaque dull yellowish-brown, and No. 3 of a dull dark-brown colour. After standing eighteen hours the liquids were filtered, when Nos. 1 and 3 filtered readily, No. 6 very quickly, and No. 5 very slowly. The precipitate which had settled down, and which, presumably, consisted of the so-called resin of aloes, was peculiarly tenacious in No. 1, of a powdery character in No. 3, of a gummy character in No. 5 and in No. 6.

From these figures it would appear that the manufacturer by keeping the juice in a liquid state for a year loses from 4–13 per cent. of solid matter soluble in water, and obtains an aloes of inferior appearance and quality. It appears also from the specimens sent that Curaçao aloes may be either dull in appearance, like Barbados aloes, or vitreous like Cape aloes.

Examined under the microscope in a drop of alcohol or ether, No. 3 presents the clearest and best formed crystals. In Nos. 5 and 6 the crystals are larger, more tabular, and less clearly defined than in the others. In all crystals are easily seen.

I find that tannin does¹ give a scanty precipitate with Curaçao aloes. This precipitate is more abundant if the aqueous solution of aloes is poured into excess of solution of tannin than if the tannin solution be added to the aqueous solution of aloes. The amount of precipitate given by aloes with tannin has been supposed to indicate the activity of the aloes (Dragendorff, "Analysis," p. 177). It is obvious that if aloes contains only less than half its weight (25 per cent. crystallisable, Tilden) of aloin, and aloin is not twice as active as aloes, that the whole of the activity of the latter cannot be due to the aloin. It must be due either to an oxidised modification of aloin as suggested by Dragendorff ("Analysis," p. 177) or to some body not yet detected in aloes. This oxidised body, called aloetin by Stoeder, is readily formed in the presence of an alkali and on exposure to air and heat. Physiological experiments are yet wanting to determine if this oxidised aloin would not be a more valuable purgative than aloin itself.

With respect to the identity of Barbados and Curaçao aloes, the distinct "Capey" odour of the latter, especially when an aqueous solution is heated, and the fact that it gives the greyish-blue colour with the sulphuric acid and nitric acid vapour test, still serve to distinguish the two aloes, and to indicate that the botanical source of the two aloes may not be identical. If Barbados aloes be really afforded by *Aloe vera*, L., then there is no doubt that the Curaçao aloes is afforded by a *different* species, viz. *A. chinensis*, Baker. But as yet I have not seen the plant in flower that yields the aloes of Barbados.

The PRESIDENT said this, like all Mr. Holmes's papers, was a very excellent one, and he only regretted that he was not present, though it could hardly be discussed. The Pharmaceutical Society was fortunate in having a man of such great ability as Curator of the Museum.

A vote of thanks was unanimously passed to the author for this paper.

¹ Contrary to the statement of Professor Stoeder (*Pharm. Journ.* [3], xvii., p. 802).

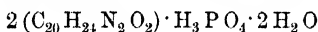
The next paper was entitled—

LABORATORY NOTES.

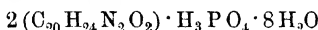
(a) QUININE PHOSPHATE.

BY GEORGE COULI, B.Sc.

Having had occasion recently to ascertain the composition of quinine phosphate for a special purpose, I consulted the authorities accessible to me, and found a considerable divergence of opinion regarding its formula. Davies says the formula (of the phosphate in Easton's syrup) may with high probability be taken as $3(C_{20}H_{24}N_2O_2) \cdot 2H_3PO_4$, but does not mention water of crystallisation (*Year-Book*, 1883, p. 571); Anderson supposes it is $3(C_{20}H_{24}N_2O_2) \cdot 2H_3PO_4 \cdot 6H_2O$, and a doubt is cast on his supposition in Gmelin's *Handbook* (vol. xvii. p. 276); Gerhart gives



(Watts' "Dictionary," 1st edition, vol. v., p. 22); Hesse, an undoubted authority on quinine,



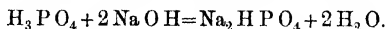
(Gmelin, vol. xvii., p. 615); Stillé and Maisch give the same formula as Hesse (*Nat'l. Disp.*, 4th edition, p. 1291), and state that the salt contains 75·85 per cent. of quinine, but the formula requires 72·80 per cent.

It was necessary in the ordinary course of laboratory work to determine with accuracy the formula of the phosphate of quinine in use which was of standard English make and obtained direct from the manufacturer. After completing the work, it occurred to me that the results obtained would be useful to others, and might appropriately be communicated to the Conference. With the view of adding to the usefulness of this note, a standard sample of German make, also direct from the manufacturer, was examined for comparison.

The *alkaloid* which may be assumed to be quinine was estimated by dissolving in water with the aid of a little hydrochloric acid, adding ammonia in excess, washing out with chloroform, evaporating and drying at 110° C. till constant.

The *phosphoric acid* was determined by titrating a solution of the salt in dilute alcohol with $\frac{N}{10}$ soda solution, using phenol-

phthalein as an indicator. The appearance of a permanent pink colour indicates that the following reaction has been completed:—



The *water* was determined by heating to 110°C . till constant. Quinine phosphate loses all its water at 100°C ., but the operation is considerably shortened at the temperature indicated. The results obtained were as follows:—

English Quinine Phosphate.

	1st det. per cent.	2nd det. per cent.	Mean per cent.
Alkaloid	75.14	75.20	75.17
Acid	16.16	16.24	16.20
Water	8.99	8.97	8.98
			<hr/> 100.35

The formula $3(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) \cdot 2\text{H}_3\text{PO}_4 \cdot 6\text{H}_2\text{O}$ requires—

Alkaloid	76.18
Acid	15.36
Water	8.46
	<hr/> 100.00

German Quinine Phosphate.

	1st det. per cent.	2nd det. per cent.	Mean per cent.
Alkaloid . . .	79.27	79.41	79.34
Acid	12.17	12.17	12.17
Water	8.54	8.36	8.45
			<hr/> 99.96

The formula $2(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) \cdot \text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$ requires—

Alkaloid	79.22
Acid	11.98
Water	8.80
	<hr/> 100.00

From these results we may conclude that the formula of the English salt is $3(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) \cdot 2\text{H}_3\text{PO}_4 \cdot 6\text{H}_2\text{O}$, and that of the German $2(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) \cdot \text{H}_3\text{PO}_4 \cdot 4\text{H}_2\text{O}$.

The fact that there are *at least* two phosphates of quinine will at once account for the different formulæ which have been assigned to it. This difference in the percentage of quinine is a point of practical importance. In the B.P.C. formula for *syrupus ferri, quiniæ et strychninæ phosphatum*, phosphate of quinine is ordered, but the formulary gives no indication as to the composition of the salt to be employed.

It would be a distinct advantage if a salt having a definite formula were specified by the Committee.

(b) *BARIUM HYPOPHOSPHITE.*

By GEORGE COULL, B.Sc.

This salt is included in the B.P.C. Formulary; it is ordered to be used in making *liquor ferri hypophosphitis fortiore* and *acidum hypophosphorosum*. The Committee have been under the impression that the barium hypophosphite of commerce is hydrated, as it is stated the salt should contain not less than 95 per cent. $\text{Ba}(\text{P H}_2\text{O}_2)_2 \cdot \text{H}_2\text{O}$.

As the following experiments show, the commercial salt is anhydrous, and if it be examined for barium alone or hypophosphorous acid alone and calculated into $\text{Ba}(\text{P H}_2\text{O}_2)_2 \cdot \text{H}_2\text{O}$, the results are very misleading.

Two samples were lately examined; previous to the quantitative determinations, qualitative tests showed only the presence of calcium and a trace of chloride in both, calcium being apparently in much larger quantity in No. II. than in No. I.

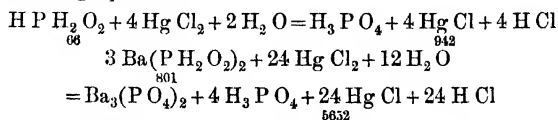
Two determinations each of barium, hypophosphorous acid, and water were made.

One gramme of the salt was dissolved, a few drops of hydrochloric acid being added, in water sufficient to make 200 c.c.

The *barium* was estimated by taking 50 c.c. of above solution, boiling, adding a little hydrochloric acid, and precipitating with sulphuric acid in excess. The precipitate was allowed to settle over-night, then filtered, washed, dried, and ignited. The filter paper was burned in a platinum spiral, the ash collected on the lid of the crucible, moistened with a drop of dilute sulphuric acid to convert the barium sulphide formed into barium sulphate, crucible and lid were then heated on Bunsen for fifteen minutes, cooled and weighed.

The *hypophosphorous* radical was determined by noting the

reducing power of the salt on excess of mercuric chloride in presence of hydrochloric acid. The amount of calomel formed is a measure of the hypophosphorous acid present, according to the following equations :—



20 c.c. above-mentioned solution were taken (= 1 gramme of the salt), 20 c.c. cold saturated solution of mercuric chloride added (this is a calculated excess), then 10 c.c. dilute hydrochloric acid, the mixture diluted to 80 or 100 c.c., and allowed to stand all night. It was then heated for half an hour in the water-bath, washed three or four times by decantation with hot water, the washings passed through a tared filter, the precipitate transferred to the filter, washed till no precipitate with silver nitrate, and dried in a water-oven till constant.

The addition of hydrochloric acid facilitates the separation of the mercurous chloride; in estimating hypophosphorous acid itself less than 10 c.c. used above would do, but in the case of barium hypophosphite there is a chance of the precipitate being contaminated with barium phosphate, although theoretically there is more than sufficient hydrochloric acid set free to convert the phosphate into chloride.

It is necessary to test the first portion of the filtrate by boiling a little in a test-tube to see if reduction is complete, and by adding sulphuretted hydrogen to see if an excess of mercuric chloride has been employed.

The water was determined by heating about 1 gramme at 100° C. till constant.

Theory for a pure hydrated salt requires 6·3 per cent. The results are here tabulated :—

No. I.	1st det. per cent.	2nd det. per cent.	Mean per cent.
Ba (P H ₂ O ₂) ₂ H ₂ O	45·59	45·83	45·71
	49·75	50·58	50·16
	1·25	1·15	1·20
Ca	indirectly	—	97·07
			2·09
			99·16

No. II.	1st det. per cent.	2nd det. per cent.	Mean per cent.
Ba ($\text{P H}_2 \text{O}_2$) ₂ $\text{H}_2 \text{O}$	38.59 52.99 1.23	39.53 52.85 1.13	39.06 52.92 1.18
Ca	indirectly	—	93.16 4.88
			98.04

These results were rather startling. In sample No. I. there is 6.65 per cent. Ba more and 2.76 per cent. $\text{P H}_2 \text{O}_2$ less than in No. II. There is excess of $\text{P H}_2 \text{O}_2$ in both samples over that required by the Ba found to form $\text{Ba}(\text{P H}_2 \text{O}_2)_2$.

Remembering that calcium was present in each, and more in No. II. than in No. I., it occurred to me that, on account of the atomic weight of calcium being 40, and that of barium 137, the deficiency of barium in No. II. would be made up by less than 6.65 per cent. calcium, and this smaller quantity would combine with the excess of hypophosphorous acid.

Calculating accordingly, the mean percentage of barium, 45.71 in No. I., requires 43.37 $\text{P H}_2 \text{O}_2$ to form $\text{Ba}(\text{P H}_2 \text{O}_2)_2$; this leaves $50.16 - 43.37 = 6.79$ $\text{P H}_2 \text{O}_2$ to combine with calcium, of which it requires 2.09; therefore adding this 2.09 of calcium to 97.07 brings the total to 99.16 per cent., leaving a deficiency of .84 for experimental error and the trace of chloride present.

Similarly No. II. contains 39.06 per cent. barium, which requires 37.07 $\text{P H}_2 \text{O}_2$ and leaves $52.92 - 37.07 = 15.85$ $\text{P H}_2 \text{O}_2$ to combine with calcium 4.88; adding this amount of calcium to the mean percentage found, 93.16, gives 98.04.

If in an examination of this article the barium alone be estimated, and calculated into $\text{Ba}(\text{P H}_2 \text{O}_2)_2 \cdot \text{H}_2 \text{O}$, it will give a percentage of 95.08, which would apparently be up to the minimum standard of purity required by the Formulary; but the salt is anhydrous, so that 95.08 $\text{Ba}(\text{P H}_2 \text{O}_2)_2 \cdot \text{H}_2 \text{O}$ is equivalent to 89.08 per cent. $\text{Ba}(\text{P H}_2 \text{O}_2)_2$; on adding the percentage of water found 1.2, the real amount of barium hypophosphite and water is 90.28 per cent., leaving about 10 per cent. for impurities, i.e. nearly twice the maximum amount of impurity allowed.

In the case of No. II., the figures are, barium found 39.06 per cent., calculated into $\text{Ba}(\text{P H}_2 \text{O}_2)_2 \cdot \text{H}_2 \text{O}$ gives 81.27 per cent.,

equivalent to $\text{Ba}(\text{P H}_2 \text{O}_2)_2$, 76.14 per cent., again adding the water found 1.18, we get 77.32 per cent. of anhydrous barium hypophosphite and water. This is a very bad sample indeed, containing fully four times the maximum amount of impurity allowed.

Again, if the reducing action alone be noted and calculated into $\text{Ba}(\text{P H}_2 \text{O}_2)_2 \cdot \text{H}_2 \text{O}$, No. II., the worst sample, appears to contain 116.1 per cent., and No. I., 110 per cent.

If the percentage of real barium hypophosphite is required, an estimation of both the barium and the hypophosphorous acid must be made; and in the absence of other metals but calcium, the latter, as shown above, may be indirectly determined with a fair degree of accuracy from the barium and acid found.

Barium hypophosphite containing not less than 95 per cent. $\text{Ba}(\text{P H}_2 \text{O}_2)_2 \cdot \text{H}_2 \text{O}$ is used in the preparation of acidum hypophosphorosum, B.P.C., and among the tests by which the purity of the acid is to be known, is one for calcium, namely, the acid should not after neutralisation give a precipitate with ammonium oxalate. It is evident that if the ordinary barium hypophosphite of commerce is employed, this result is practically unattainable. Therefore, in view of the variation which exists, and the fact that the commercial article is anhydrous and generally contains lime, it seems desirable for the Formulary Committee to specify the anhydrous salt and to raise the standard of purity.

(c) *PHOSPHORIC ACID.*

By GEORGE COULL, B.Sc.

The object of this short note is to point out a very annoying contamination sometimes met with in this acid, and to suggest a simple test whereby it may be detected.

The trouble arose in dissolving iron wire in phosphoric acid (1.75) and water during the manufacture of syrup. phosph. co. The solution took a much longer time to filter than usual; in fact, it took as many days as it formerly took hours. Lint, absorbent cotton, even muslin, rapidly got choked up, and filtration came to a standstill.

On diluting a little of the acid for the purpose of examining it, a gelatinous precipitate appeared. A quantity was diluted to the strength of the B.P. acid (1.5); the precipitate took some time to settle, and on decanting the clear portion and diluting to make

acid. phosph. dil., a further deposit appeared, which, from the low specific gravity of the acid, settled more quickly.

A considerable quantity of the syrupy acid was therefore diluted to make the dilute acid of the Pharmacopœia, and the precipitate collected in a bottle and allowed to settle further, the clear liquid decanted, and the precipitate put on a filter and washed, with the aid of the filter pump, with boiling water till free from acid.

It then presented an appearance similar to glycerine of starch, but with a dirty tinge, and was quite insoluble in acids. A portion of it was ignited in a platinum crucible, when it became almost white and assumed a hard and gritty condition. On reducing some of this to a fine powder, and testing in a borax bead, it dissolved and formed a clear bead, and, on adding the powder to saturation, the bead became opaque, thus showing that it was silica.

Last year Mr. Hodgkin, in his exhaustive paper on "Glacial Phosphoric Acid," mentioned that one of his samples contained a small quantity of silica, which was originally present in the phosphoric acid employed. And, in replying, he said, "that all glazes were attacked by concentrated phosphoric acid, and occasionally samples of foreign acid were met with, containing large quantities of silica, and which clearly had been evaporated in porcelain or earthenware vessels. Platinum was the only thing which could be properly used."

The Pharmacopœia directs the concentrated acid to be evaporated down a certain length in a flask or porcelain dish, and then transferred to a platinum dish and concentrated there. If evaporated too far in the porcelain dish there is sure to be some silica dissolved, and to guard against this being present I would suggest the addition to the official tests of the words, "when mixed with an equal volume of distilled water no precipitate should be produced." It would also be better to employ platinum vessels for the whole process of evaporation.

Mr. DOTT said the formula of Hesse for quinine phosphate was the correct one, and Mr. Coull's note agreed with it except as to the water of hydration. It was probable that the salt might be prepared with eight molecules. With regard to the barium hypophosphite he had not made the minute analysis that Mr. Coull had, but estimating it only by chloride of mercury and hydrochloric acid the salt yielded apparently 100 per cent.; it

contained hypophosphorous acid equal to 100 per cent. Mr. Coull said the salt was anhydrous, but gave a certain percentage of water. It was often assumed that a salt must contain one molecule of salt and one or two of water, while as a matter of fact it might be, not a fractional part of a molecule, but so many molecules of barium salt to one of water. He had examined a great number of samples of phosphoric acid and had not come across silica as an impurity. The common failings were a deficiency of phosphoric acid and a greater amount of iron.

Mr. TYLER said he was glad to hear what Mr. Dott said about the barium hypophosphite. He agreed largely with Mr. Coull that 90 per cent. of this salt contained impurities of the calcareous order, which was not good manufacturing, and certainly not good pharmacy. He did not know the origin of these samples, but as a manufacturer he should be very sorry to have such an amount of impurity brought to his notice. On the other hand, Mr. Dott, whose skill and accuracy no one could contest, said the samples he had examined were found to be unexceptionable. In the previous day's discussion it was pointed out that lithium salts in the granular condition were generally found to contain alkaline salt, but in this case there was no physical condition to indicate impurity. Manufacturers had to supply what they were asked for; and while there were many differences unknown and undreamed of in the manufacture of barium hypophosphite, that was no justification for selling an article which was not to all intents and purposes of the nature and substance demanded. It was perfectly clear that this salt had been made by a process of double decomposition, and there was no justification for employing such a process in which a soluble calcium salt was one of the elements. With regard to the phosphoric acid, he was glad to find that Mr. Dott had not met with silica as an impurity, though beyond the difficulty it had occasioned Mr. Coull it was really a very small matter. An enormous bulk of gelatinous silica would weigh very little, but the cause of its presence was undoubtedly as suggested. In a recent case at Woolwich Police Court, when tartaric and citric acids were in question, it was asked by one of the legal gentlemen whether platinum vessels could not be used. In works on a large scale that would be a serious matter to any but wealthy capitalists. Still, he adhered to the position that manufacturers must supply the article demanded, and on Mr. Dott's authority they did so. No doubt the presence of silica was due to the use of porcelain or glass vessels, and the concentration

had taken place at a point which Mr. Coull scarcely defined. The Pharmacopœia might need amendment, but he hoped those who arranged the details of manufacture would hesitate before recommending any particular apparatus.

Mr. MARTINDALE said phosphate of quinine was a preparation in the Unofficial Formulary, and, as Chairman of the Committee, he might say they would be very glad to have an authoritative statement to the effect that one phosphate of quinine and not another would enable Easton's syrup to keep it in solution. He could not quite agree with Mr. Tyrer that manufacturers supplied what the public demanded. The public demanded that these articles should be pure, and there was no reason to allow of impurities, as lead in citric and tartaric acids, when they could be got rid of. The same with regard to silica in concentrated phosphoric acid, there was no need for it to be there. All articles should be up to the Pharmacopœia standard, unless it were proved to be impossible.

Mr. TYRER explained that he quite agreed with Mr. Martindale, that it was the business of the chemical manufacturer to devise processes which would produce pure articles. He only asked for some sympathy with manufacturers in dealing with large quantities. Up to the present nothing had been found except platinum to resist the action of phosphoric acid at a high temperature in a concentrated condition. At the same time, it was evident that phosphoric acid was produced commercially, free from silica.

Mr. HODGKIN, as a manufacturing chemist, did not wish it to be understood that they tried to make an article which would just scrape through. Manufacturers made the best articles which could be produced commercially; and if any one wished an article better than that, it could almost invariably be made, but increased purity meant increased cost. To get rid of a very slight percentage of impurity might entail a far more costly process in every way. Citric acid had been made for many months past in this country of almost absolute chemical purity, but it was mainly exported to Germany. People here would not pay the price for it.

The PRESIDENT said they must now proceed to the next paper, but he believed he was right in saying that the Conference had no sympathy with manufacturers; they were quite able to look after themselves.

Mr. COULL, in reply to Mr. Dott's statement that Hesse's formula was the correct one, said his figures had been obtained by actually analysing quinine phosphate, and he was prepared to abide by them. With regard to testing barium hypophosphite by means

of perchloride of mercury alone, and calculating the hypophosphorous acid found into the barium salt, one got very misleading results. Thus No. II., *really* the worst sample, apparently contained 116.1 per cent. $\text{Ba}(\text{PH}_2\text{O}_2)_2 \cdot \text{H}_2\text{O}$. With regard to the phosphoric acid, he only said the silica was an annoying contamination *sometimes* met with; the most he had used had been very pure. But though silica was small in weight, it might be large in volume, and in the amount of trouble it created.

A hearty vote of thanks was accorded to Mr. Coull for his interesting communications.

The next paper read was—

NOTES ON THE MELTING POINT OF CACAO BUTTER.

By T. MALTBY CLAGUE.

In connection with some experimental work on the influence of some drugs commonly used in suppositories and pessaries on the melting point of cacao butter, the results of which were published in the *Chemist and Druggist* of June 6th, 1891, it was considered desirable to examine a number of trade samples. I now offer the results of this examination:—

Trade Sample.	Melting Point.
No. 1.	74°·5
„ 2.	73°
„ 3.	73°·5
„ 4.	74°
„ 5.	75°
„ 6.	83°
„ 7.	78°
„ 8.	74°
„ 9.	84°
„ 10.	91°

Pharm. Brit. gives 86° to 95° as the range of melting point.

A sample expressed by myself, with heat, from the nibs, gave 91°. One obtained by percolation of the bruised nibs with ether gave 83°.

One obtained by percolation with ether from the prepared cocoa of the firm sending out trade sample No. 5 gave a melting point of 96°; showing that their mode of extraction took out the butter of lower melting point, or that it was altered in course of manufacture.

Having observed statements by Redwood and A. H. Allen that some fats possessed a twofold melting point, an original one,

and one acquired after heating to a few degrees above melting point, I was curious to know how cacao butter behaved in this respect; and also whether the rise in melting point was maintained or was only evanescent.

I examined two trade samples, No. 5 and No. 9 of first table.

	Sample No. 1.	Sample No. 2.	Sample No. 3.
Original melting point	= 75°	86°	86°
After being heated to 105° m. p. .	= 77°·5	89°	86°
" " 120° " . .	= 84°	85°	91°
" " 150° " . .	= 85°	83°	92°
" " 180° " . .	= 80°	80°	85°

After having obtained results of No. 1 and No. 2, I must own that I was much puzzled at the contrary results noted; and I therefore prepared a sample by percolation with ether from unroasted nibs, thus obtaining a butter which had not been heated at all previous to my treatment. Its behaviour is noted under sample three of the foregoing table. From these it would appear that cacao butter (in accordance with the observation of others) undergoes a rise in its melting point; that if temperature be further increased its melting point becomes lowered to an intermediate one; further experiments seemed to indicate that this intermediate melting point was maintained for a few days. Longer trial is, however, desirable.

Another quantity of No. 5 trade sample was then kept at a temperature just under 100° for two hours, and its subsequent melting point was found to be 86°. This would indicate that the time during which heat is applied is also a factor in determining the rise in melting point.

The question naturally arises, To what can these changes be due? and I think it is to a chemical investigation of the butter that we must look for the solution. Meanwhile it may interest the dispenser to know that fluctuations in the melting point of cacao butter can oftentimes be put down to the influence of heat only, and I may be allowed to reiterate a caution as to the use of cacao butter, in suppository making, which at all closely approximates in its melting point to the temperature of the human body.

The method of taking the melting point which I have used was the mercury mode of the late Emeritus Professor Redwood.

The following paper was then read :—

NOTE ON THE DETERMINATION OF MELTING POINTS BY CAPILLARY TUBES.

By T. MALTBY CLAGUE.

Although this mode of taking melting points is spoken of distrustfully by some authors, I have not been able to find any definite impeachment of its claim to reliability, and I therefore venture to offer the following observations on it, and would like it to be understood that my experiments as here recorded relate to fats of the cacao butter class, and in some instances to their admixture with white wax.

A somewhat curious incident first drew attention to the subject. For an experimental purpose it was considered desirable to melt six ounces of cacao butter in a beaker without allowing its temperature to rise much above its melting point as determined in a capillary tube. The fat was placed in a beaker, and this in a water-bath, and it was found impracticable to melt it within 10° F. of the previously determined melting point. The tube previously used was then plunged into the buttery semi-solid fat, and its contents immediately became bright. A fresh portion of the *ol. theobrom.* was melted and sucked up into a piece of glass feeding-bottle tube, allowed to cool, and then plunged into the same semi-fluid mass; it also became bright, although its only source of heat was the unmelted fat in which it was immersed. This may be partly accounted for by what I have pointed out in a previous paper as to the behaviour of the cacao butter under prolonged heating, but the following experiments will show the effect of the size of the tube on the point of fusion.

A number of glass tubes were selected of varying diameter, but all large enough to take the bulk of a Hick's half-minute clinical thermometer. The substance chosen was a mixture of cacao butter and white wax, so proportioned that its melting point should fall within the range of the thermometer. A difficulty presented itself in the fact that this maximum thermometer did not possess a retrogressive movement, but when this was borne in mind and the temperature allowed to rise very slowly, and when only the point of fusion and not the resolidifying point was to be observed, it was not much felt.

No. 1 tube.	. . .	·15 inch diam.	m. p. = 103°·8 F.
No. 2 „ . .	. . .	·24 „	„ = 105° F.
No. 3 „ . .	. . .	·42 „	„ = 106°·3 F.
No. 4 „ . .	. . .	·64 „	„ = 110° F.
No. 5 „ . .	. . .	1·26 „	„ = 113° F.

Melting point by Redwood's mode was 105°.

Another series was set on in smaller tubes, and a difficulty presented itself in obtaining the inside diameter of the tubes. This was accomplished in the following manner. The tube was filled with mercury and the quantity of mercury which it contained weighed; the weight of an inch length of mercury was thus obtained.

An instance will suffice. One tube gave 13 grains of mercury to the inch. The weight of a cylindrical inch of mercury was known to be 2692·8 grs.

Square root of 2692·8	. . . . .	51·9
Square root of 13	. . . . .	3·6

therefore tube $\frac{3·6}{51·9} = \frac{1}{17}$ inch the diameter of tube. Let $x =$ square root of number of grains in 1 inch length of tube, the fraction $\frac{x}{51·9}$ is its diameter. The precaution of allowing tubes to remain one hour after filling, before taking the melting point as given by Mr. A. H. Allen, was observed. Results—

Diameter of Tube.	Point of Clear Fusion.
$\frac{1}{17}$	86°
$\frac{1}{8}$	83°
$\frac{1}{5}$	82°
$\frac{1}{3}$	81°

Melting point by Redwood's mode was 85°.

In this series the tube was attached to the bulb of the thermometer and immersed in a water-bath.

The "British Pharmacopœia," under the heading of *Cera Flava*, gives instructions to use "a capillary tube"; while Professor Attfeld, in his *Manual*, directs "a tube the size of a knitting needle." Knitting needles are of various sizes, and the term capillary tube is one of wide range; and I think I have shown that both are too lax to admit of successful use in the case of this fat.

Many theories have presented themselves to my mind, but until

other fats have been carefully examined I will not venture to advance them. One observation I would like to make, and that is that in watching the tubes it was seen that in the larger tubes some globules of a less readily fusible nature were floating in an otherwise bright fluid, giving an opacity to the whole; whilst in the smaller tubes such aggregations did not take place. Was it the small bore of the tube which prevented their separation from the more flexible portion?

I have referred above to a caution given by Mr. A. H. Allen in his comprehensive instructions on points of fusion in "Commercial Organic Analysis," that capillary tubes, after being filled, should be left at rest for at least an hour before the determining observation is made.

An observation on two of the cacao butters with which I have been at work may serve to show the effect of this.

Sample I.

Ten minutes after filling	. . . .	75°
One hour and a quarter after filling	. . . .	85°
Twenty-four hours after	„ . . .	90°

Sample II.

Ten minutes after filling	. . . .	89°
Four hours after	„	92°

Mr. MARTINDALE thought the difference of melting point might, to some extent, be accounted for by the fact that cacao butter, especially when fractionated, contained different principles, probably stearin and olein; in a mixture of the two the latter lowered the initial melting point of pure stearin.

Mr. ALFRED ALLEN said he could endorse what Mr. Clague said as to the difficulty of determining the melting point in a capillary tube; you might have several discordant observations and not know which was the right one. As Mr. Martindale said, when you had a mixture of several bodies having different melting points you did not know which one to take.

The author was thanked for his interesting communications.

The next paper, in the absence of the authors, was read by Mr. Peter MacEwan, F.C.S.

THE SOLVENT ACTION OF ALCOHOL OF DIFFERENT DEGREES OF STRENGTH ON SOME OF THE DRUGS USED IN MAKING PHARMACOPŒIAL TINCTURES.

BY E. H. FARR AND R. WRIGHT,

Pharmaceutical Chemists.

TINCTURE OF CINCHONA.

Cinchona bark may almost be said to have been the *bête noir* of pharmacy, and its preparations have received more attention at the hands of practical pharmacists than those of any other drug, except perhaps opium.

The difficulty, if not the impossibility, of effecting complete exhaustion of the drug by aqueous treatment, and the consequent fact that neither the infusion, the decoction, nor the fluid extract represents the full medicinal activity of the drug from which they have been produced, has always been admitted.

Conclusive proof of this, so far as the preparations of yellow cinchona bark are concerned, was first afforded by Mr. C. Ekin, who, in a paper read at the Pharmaceutical Conference of 1878, showed that the fluid extract did not contain more than one-fourth, and the infusion and decoction not more than five-eighths of the alkaloids present in the bark.

These results were substantially confirmed by Dr. B. H. Paul, in a note read at an evening meeting of the Pharmaceutical Society (*Pharm. Journ.* [3], xiii. 737).

Opinions have been divided as to whether or not a more satisfactory exhaustion of the bark is effected in the process of making the tincture.

Ekin, in the note just alluded to, stated that in working on a bark containing 2 per cent. of quinine, the exhaustion was practically complete; Paul, on the contrary, asserted that from the marc remaining from the preparation of the tincture it was possible to prepare a second tincture equal in strength to the first, and this was confirmed by Braithwaite (*Pharm. Journ.* [3], xiv. 445), who found that in making the B.P. tincture not more than half the alkaloids were extracted. In the 1885 Pharmacopœia, owing mainly to the recommendation of Mr. E. M. Holmes and the late Mr. J. E. Howard, the bark of *Cinchona succirubra* was substituted for that of *Cinchona calisaya* for the production of the galenical preparations of cinchona.

Since that time no experimental data, showing the extent to

which exhaustion is effected in the preparation of the decoction and the acid infusion, have been published. The tincture has, however, been submitted to examination by Mr. J. S. Ward (*Pharm. Journ.* [3], xviii. 464), who in a paper read before the Liverpool Chemists' Association, showed that commercial samples of the tincture only contained 45 per cent. of the amount theoretically required, presuming that the drug used in the preparation of the tincture had been completely deprived of its alkaloid.

In order to ascertain how far the exhaustion of red cinchona bark could be effected by means of an alcoholic menstruum, and also to find by what menstruum the most perfect exhaustion might be secured, thirteen specimens of the bark were obtained, and after being reduced to No. 40 powder, a series of tinctures was made from each, by the B.P. process, with alcohol of 90, 80, 70, 60, and 50 per cent. strength (by volume).

All the specimens of the drug employed were found to be fully up to the B.P. standard; and in four cases the alkaloidal content was in excess of the requirements of the B.P., the amount varying between 6 and 8.2 per cent.

In order to ascertain what method was best adapted for the determination of the alkaloids, the following experiments were tried upon a standard tincture:—

Experiment I.—25 c.c. of the tincture was acidified with dilute sulphuric acid, and evaporated over a water-bath until all spirit had been driven off. The residual liquor was filtered, an excess of soda solution added, and the alkaloids extracted by agitation with benzolated amylic alcohol. From the latter solution the alkaloids were withdrawn by agitation with acidulated water, and were subsequently recovered from the mixed acid solutions, after the addition of an excess of soda solution, by shaking with chloroform.

Experiment II.—25 c.c. of the tincture was boiled with a little slaked lime, the mixture filtered, and the precipitate washed with 50 c.c. boiling methylated spirit, added gradually. The filtrate was then acidified with dilute sulphuric acid, and evaporated over a water-bath until the alcohol had been driven off. The liquid was then made alkaline, and the alkaloids removed by means of benzolated amylic alcohol. The latter solution was shaken with small quantities of acidulated water in order to remove the alkaloids, which were subsequently recovered from the mixed acid solutions by adding an excess of solution of soda and shaking with two or three successive portions of chloroform.

Experiment III.—25 c.c. of the tincture was mixed with a little

slaked lime, and the mixture evaporated to dryness over a water-bath. The dry extract was mixed with a little sand, and the alkaloids extracted by means of boiling chloroform. The chloroformic solution was then shaken with successive small portions of acidulated water, the latter solutions mixed and made alkaline, and the alkaloids shaken out with chloroform.

Experiment IV.—10 c.c. of the tincture was diluted with 50 c.c. water, an excess of soda solution added, and the liquid shaken up with four successive small quantities of chloroform. From the mixed chloroformic solutions the alkaloids were extracted by agitation with acidulated water. Finally, the mixed acid alkaloidal solutions were made alkaline, and the alkaloids shaken out with chloroform.

The results came out as follows :—

Exp. 1.	100 c.c. tincture	=	·778	gramme alkaloids.
„ 2.	100 „ „	=	·784	„ „
„ 3.	100 „ „	=	·872	„ „
„ 4.	100 „ „	=	·928	„ „

In order to ascertain whether the last process yielded the alkaloids in a pure condition, another sample was examined by it, and in order to check the result a second experiment was also made, the tincture being evaporated to remove the spirit, the residual liquor acidified, the alkaloids precipitated as periodides, the latter decomposed by means of a 5 per cent. solution of sulphurous acid, and the alkaloids recovered from the solution, previously made alkaline, by shaking with chloroform.

The following results were obtained :—

By process 4 .	100 c.c. tincture	=	·790	gramme alkaloids.
By precipitation	100 „ „	=	·780	„ „

The following is the detailed process of examination adopted :—10 c.c. of the tincture is introduced into a stoppered glass separator and diluted with 50 c.c. water; a slight excess of soda solution is added, and the alkaloids removed by shaking, first with 10 c.c. and then with three successive 5 c.c. chloroform. The chloroformic solutions are drawn off in turn, mixed, and the alkaloids taken out by shaking with successive small quantities of acidulated water, until the latter ceases to give alkaloidal indications with Mayer's reagent. The acid solutions are mixed and made alkaline, and the liquid shaken, first with 10 c.c. and then with two successive 5 c.c. chloroform. The latter is drawn off into a tared

platinum dish and evaporated over a water-bath, the residue dried in a water-oven at 100°, and the weight taken.

The results of the examination of the tinctures are given in Table I.

The percentage of extractive was ascertained by evaporating 10 c.c. of the tincture, drying the residue at 100°, weighing, and multiplying the result by ten.

A glance at the table of results will show that the most complete exhaustion of the drug is made by the employment of a 70 or 80 per cent. menstruum.

A study of the table also proves that alcohol is a better solvent of the active principles of cinchona than has been generally supposed. The weakest series of tinctures in the table contain 60 per cent. of the alkaloids present in the bark operated upon; and in the case of the specimen from which No. 8 series was prepared, and which contained 8.2 per cent. total alkaloids, no less than 91 per cent. was extracted. It is our intention to deal with the subject of the standardisation of this tincture in a subsequent paper. In order to test the comparative value of alternative processes for the preparation of this tincture, two samples of bark, one in No. 40 and the other in No. 60 powder, were taken and a series of tinctures made from each with a 70 per cent. menstruum, by the processes detailed in previous notes on tincture menstrua, and termed by us simple maceration, double maceration, macero-percolation, and continuous percolation.

These tinctures were examined by the process previously employed, with the results shown in Table II.

The results there indicated sufficiently establish the superiority of the percolation processes, and seem further to prove that the process of macero-percolation, and that of continuous percolation, are about equally well adapted for the preparation of this tincture.

Mr. GROVES said this was a useful paper in a very valuable series, and might lead in the next Pharmacopœia to several strengths of alcohol being introduced, corresponding to the drugs to be treated; the broad distinction between proof spirit on the one hand and rectified spirit on the other being no longer adhered to. He had several times deviated from those two strengths; in particular he found that the tincture of cascarilla made with proof

Table I.—Showing Quantitative Results of Examination of Tinctures of Cinchona.

No. of sample.	Amount of alkaloid in grams from 100 c.c. tinctures.					Amount of extractive in grams from 100 c.c. tinctures.				
	80 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	90 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.
1 . . . . .	.80	.79	.88	.85	.78	6.96	6.96	8.04	8.06	7.60
2 . . . . .	.76	.84	.89	.85	.77	4.16	4.76	5.14	4.96	4.70
3	1.20	1.29	1.28	1.36	.97	6.24	6.40	6.24	7.30	6.64
4	1.22	1.22	1.37	1.10	1.15	5.76	5.66	5.40	5.40	5.90
5 . . . . .	.80	.94	.83	.83	.71	5.20	5.82	5.98	5.56	5.18
6	1.10	1.15	1.16	1.09	1.01	5.72	5.96	6.40	6.10	5.94
7 . . . . .	.66	.79	.78	.74	.61	4.56	5.20	5.30	5.62	5.00
8	1.27	1.50	1.50	1.43	1.26	6.98	7.62	7.90	7.68	7.46
9 . . . . .	.84	.93	.85	.84	.84	4.90	5.44	6.02	5.64	5.76
10 . . . . .	.37	1.00	.85	.77	.73	5.72	6.22	5.14	5.03	4.98
11 . . . . .	.73	.70	.82	.76	.74	4.86	5.25	5.58	5.00	4.64
12 . . . . .	.68	.76	.78	.69	.65	5.42	6.04	6.32	6.00	5.74
13 . . . . .	.76	.89	.90	.82	.82	4.50	5.24	5.56	5.16	5.40
Average . . . . .	.91	.99	1.00	.93	.87	5.46	5.89	6.14	5.96	5.76

Table II.—Showing Results of Experiments on Process for making Tincture.

		Percentage of alkaloid.				Percentage of extractive.			
		By Maceration.	By Double maceration.	By Macero- percolation.	By Continuous percolation.	By Maceration.	By Double maceration.	By Macero- percolation.	By Continuous percolation.
No. 1	.	·68	·65	·89	·97	4·10	4·00	5·06	5·34
No. 2	.	1·07	1·06	1·38	1·29	5·16	5·28	6·46	6·24

spirit was nothing like so good as when the spirit was slightly stronger.

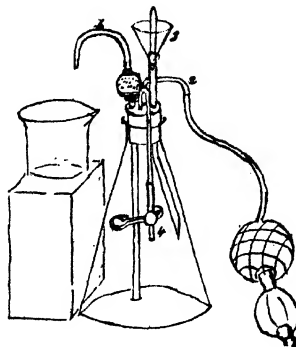
A vote of thanks was accorded to the authors for their paper.

The next paper read was a—

NOTE ON A SIMPLE PRESSURE FILTER, USEFUL IN "MAYER" ESTIMATIONS.

By F. C. J. BIRD.

Some years ago, in a paper read before the Chemists' Assistants' Association (*Pharm. Journ.*, xvii. 826), I described a modification of Wynter Blyth's filter-tube, which had proved very useful to me in the estimation of alkaloids by Mayer's reagent. For some time past however, in the assay of preparations of ipecacuanha, I have been using a somewhat different arrangement, which is even more convenient and expeditious than the filter-tube alluded to. Its construction is as follows¹:—



A 10-ounce conical flask is fitted with a rubber cork pierced with holes for four glass tubes. Tube No. 1 extends almost to the bottom of the flask. Just above the cork it expands into a bulb, afterwards being drawn out to about half the original diameter, and then curved over so that the orifice points downwards. Tube No. 2 is connected with the ball and attachments of an ordinary spray producer. Tube No. 3 carries a small funnel closed by a stopper, and is bent at an angle inside the flask, and its extremity

¹ The woodcut of this illustration was kindly lent by the editor of the *Pharmaceutical Journal*.

cut off diagonally. A burette clip is fitted to the remaining tube. The bulb in tube No. 1 contains powdered asbestos, kept in position by plugs of tow or other loose material.

The alkaloidal solution may be placed directly in the flask, and Mayer's reagent run in through the funnel until a point is reached at which it is no longer possible to observe further precipitation without waiting for the liquid to clear. The stopper should then be inserted in the funnel and the clip closed. On compressing the ball the liquid in the flask is forced up through the asbestos and runs clear and bright from the orifice of the tube into a beaker placed beneath. A sample of this may be tested with a drop of reagent from the burette, and if necessary returned to the flask by the funnel, the operation being repeated until no further precipitation takes place. When the end-point of the reaction is nearly reached it is desirable to drive out the liquid in tube No. 1 and return to the flask before testing. Should the asbestos become clogged with precipitate and the filtrate pass too slowly, it is only necessary to attach the rubber ball to the orifice of tube No. 1, and force air through the filter the reverse way.

The PRESIDENT said this seemed an original and clever mode of effecting filtration, and was quite new to him. Every one who had occasion to use Mayer's reagent could not but be grateful to Mr. Bird.

Mr. WILLIAMS said there was no doubt the use of Mayer's reagent would be largely extended by the introduction of this simple apparatus.

THE ACTION OF IODINE ON PHENOLS IN ALKALINE SOLUTIONS, WITH SPECIAL REFERENCE TO THEIR VOLUMETRIC ESTIMATION.

By T. R. CARSWELL.

Having had occasion to examine some samples of phenol recently, and being desirous of a volumetric method, if possible, I betook myself to make use of the above reaction, as suggested in the journals recently (originally given, I believe, by Messrs. Messinger and Vortmann—*Chem. Zeitung*, 1890, p. 291, referred to in the *Pharm. Journ.*, June 13th, 1891, and more recently referred to and reported on before various Associations); but I had not

travelled far when I observed discrepancies which required looking into. Working in the manner suggested, I obtained results which on calculation gave the respective percentages 73, 83, and 87 for samples which I knew did not greatly differ; so that it at once became apparent that the method, as given, was either useless or very far from exact. Accordingly, when time presented itself, I instituted the following experiments with a view to clearing up the matter, if possible, and also by way of making a short study of the reaction, if time permitted. I shall at once tabulate some of the experiments as made, appending a number to each, to which numbers I shall refer as occasion arises. The solution operated on contained 1 gramme phenol in 300 c.c., the solvent of course being water, a convenient quantity being taken, as experiment required.

In all the cases tabulated the precipitates obtained on acidification were more or less white. Those obtained in presence of potash were less tufted than those obtained in the presence of soda.

One point particularly attracted my attention in conducting this series of experiments, which is perhaps worth while reciting, although, probably, the point is well known,—that is, the flighty nature of the end reaction when titrating in the presence of the potash salt, as compared with the comparatively stable end reaction in presence of the soda salt, which recalled to my mind a half-sympathetic and half-humorous dental saying, "The last to come and the first to go," which is somewhat analogous to the above case, the end taking longer to establish itself definitely in presence of potash salt, whilst it is the first to depart, the reaction reversing further in 30 minutes with potash than in 12 hours with soda.

In order to test the trustworthiness of the method followed, and also the normality of the caustics used, so far as substances of an interfering nature were concerned, two blank experiments were carried out without phenol, and the results were altogether satisfactory. That is, I proved no loss of iodine took place, and that nothing of an interfering nature existed in the caustics, at any rate in the absence of phenol. I say, in the absence of phenol, because it by no means followed that there was no substance present which would interfere in the presence of phenol.

I must somewhat claim the indulgence of the Conference for the scattered nature of the results tabulated above, as they were originally noted to satisfy my curiosity, without any intention of publication, and I must at once disclaim any intention to criticise

No.	Name of Alkali and quantity used.	Quantity of solution taken.	Time allowed after addition of Iodine.	Temperature.	Quantity of I_N used in c.c.	Quantity of Iodine consumed as found by titration in c.c. I_N .	Percentage of Phenol calculated.
1	·32 gram. $KH O$	10 c.c.	30 min.	60° C.	25	15·4	72
2	"	"	"	50° C.	25	14·8	69
3	"	"	" (over)	75° C.	25	14·99	
4	"	"	"	40° C.	25	14·5	
5	"	"	"	90° C.	25	14·77	
6	·32 gram. $Na H O$	"	"	60° C.	25	14·66	
7	"	"	60 min. (over)	60° C.	25	14·11	
8	"	"	35 min.	60° C.	25	14·61	
9	·64 gram. $Na H O$	"	30 min.	60° C.	25·6	14·1	99·6†
10	1·28 "	"	"	60° C.	25·2	13·8	
11	1·28 gram. $KH O$	"	"	60° C.	25·0	13·5*	
12	1·28 "	"	"	60° C.	25·2	13·5†	
13	·32 "	"	20 min.	60° C.	25·0	15·76	
14	·32 "	"	10 min.	60° C.	25·1	15·75	

* Standing for about thirty minutes after titration required about ·2 c.c. more hypo, the action reversing.

† Titrated in the absence of the bulk of the precipitate.

‡ Per cent. calculated on 4 atoms iodine to 1 mol. phenol theory.

the process as it had been suggested—nor, indeed, would I be justified in doing so—but merely to give my experience of the process in actual practice, under the conditions which would obtain in actual practice, and the steps which would most likely suggest themselves from observing the points of the process, as given.

In all the above experiments the mixture was titrated for excess of iodine in presence of the precipitated phenol compounds, having satisfied myself by experiment that it was immaterial whether this was the case, or whether the precipitate was allowed to settle, and an aliquot part drawn off for titration; and that being the case, it will be at once conceded that the titration of the whole was the more accurate method, more especially when we consider the flocculent nature of the precipitate, and the possible "enclosure" of iodine, not to speak of the probable loss of iodine in the prolonged manipulation.

It will be seen from the above table that the iodine consumed varies as the temperature, and that a temperature of $60^{\circ}\text{C}.$, speaking roundly, is the most favourable to the reaction, a decrease in the consumption taking place, according as the temperature is higher or lower than 60° ; that the consumption of iodine varies as the time allowed after addition of the iodine, until titration for excess; that the reaction is complete in about twenty minutes; and that no less time than fifteen minutes, nor more than thirty minutes, should be allowed.

I would not draw any hard and fast conclusions from the results obtained by variation of the quantity of alkali, because, where the higher quantities were used, the apparent excess of iodine became greatly lessened, or rendered nil, so long as the quantity of iodine added remained the same, which of course at once annihilated possibly one of the most important points in the process, namely, to add the iodine until the phenol solution was rendered strongly yellow from excess of iodine. Unfortunately, in all the above experiments, and indeed in many of those which I have yet to tabulate, I neglected to note the depth of colour of the phenol solution (or perhaps I had better call it the phenol mixture) when the addition of iodine was stopped; but at any rate in the cases where $\cdot 32$ gramme of alkali was used, the phenol mixture presented a fairly yellow colour, sufficiently yellow, I thought, to satisfy the above condition, namely, to have an excess of iodine present; and even in the cases where larger quantities were used it remained yellow for some time, except, perhaps, where $1\cdot 28$ gram. was used, in which case it almost immediately became colourless

when the iodine was stopped. In this connection I may remark, that since the excess of iodine requires to be judged in this way, it at once becomes a matter of importance to observe the extent to which dilution is carried before the addition of iodine. For instance, if in one titration the dilution be carried to say 20 c.c., and in another to 40 c.c., before the addition of the iodine, the former may present a strongly yellow colour, whilst the latter only a slight yellow; but the quantity of iodine actually added is the same in both cases, and one would imagine the excess of iodine would also be the same. If I take a solution of alkali and add excess of iodine to it, even to a red colour, and then evaporate slowly, I shall soon obtain a perfectly colourless solution to the eye, which would seem to indicate that all the iodine has combined with the alkali; but if I carry the evaporation to dryness (in contact with the air), free iodine begins to show itself, and it takes a good deal of heat to drive it off. Of course the alkali used contained carbonate, which it usually does. I merely mention those points as bearing more or less directly on the ocular judgment of the excess of iodine; for I shall probably show that much more than an ocular excess of iodine is required if the factor given was to be applied.

I have already spoken of the excess of iodine as "apparent," because it is plain that 25 c.c. decinormal iodine is far from being able even to saturate the alkali; but nevertheless, since the mixture presented a strongly yellow appearance, it was sufficiently evident that for the practical purposes in the above experiments an excess of iodine did exist, provided the colour remained at least ten minutes, that is, until the reaction had practically completed itself. In observing the point of the process dealing with the excess of iodine it could not be imagined that only the quantity sufficient to produce the yellow colour in such a small volume of fluid was of use in the impending reaction, but rather that the whole quantity of iodine added was required, and that the presence of an excess was merely a safeguard that enough had been added to satisfy the phenol present, the check being that at least three molecules of alkali be present for each molecule phenol; and it was argued that if an excess was present, the condition was satisfied, the phenol being supposed to be able to upset the balance between iodide and iodate, or never to allow it to be established until it was itself satisfied; and it was further argued that this condition was still satisfied, even if the colour disappeared entirely, provided the disappearance was brought about through the solution containing

a greater quantity of alkali, and that I already knew the quantity of iodine required to give a good excess over the phenol present.

The above experiments, however, proved that for the same quantity of iodine the amount "consumed" varied with the quantity of alkali present, although, I may remark, the precipitates obtained were quite similar in appearance. In all the above experiments the precipitates obtained were of a more or less white colour, whereas in those mentioned at the beginning, which yielded the percentages 73, 83, and 87, the precipitates were more or less red, as was mentioned in the text. In the above table the several percentages have not been worked out, as those given are sufficiently indicative of the others for my purpose, it being readily seen that all through, the result is about 30 per cent. too low, calculated on the basis of the factor given; indeed, the results require the application of a factor derived from the assumption that each molecule phenol consumes four atoms iodine, instead of six; and if this factor, say 1.85, be applied to the result of experiment 9, the percentage obtained is very nearly correct, and the conditions under which it is obtained are fairly definite, and not subject to any great variation; and in experiments 8, 9, and 10, where the quantity of alkali varies so largely as one to two, the variation in the calculated percentages (using the above factor) is much less than in the three estimations mentioned at the beginning, and what is more important, are much nearer the truth. Having observed the above variations brought about by varying the quantity of alkali, it at once became of interest to find out if any constant relationship existed, and if possible, the cause; and with those ends in view I instigated the following experiments, which were carried out with a much greater approach to accuracy, so far as measurements were concerned, than those already enumerated. I shall at once tabulate them (see next page), and afterwards refer to them.

I had fancied from previous experiments that the quantity of iodine consumed varied with the kind of alkali used; hence I made experiments 16 and 17, and the results give slightly an affirmative answer. At first sight one would be apt to think that I had completely overturned the results of two previous experiments, referring to numbers 1 and 6, but it will be seen on closer observation that in 1 and 6 equal weights of the two alkalies were used, whereas in 16 and 17 equivalent weights were used, and the results of 1 and 6 are completely in accord with the general result, namely, that under like conditions an increase in alkaline power diminishes the consumption of iodine.

No.	Name of Alkali and quantity used.	Extent of dilution before addition of iodine (roughly).	Quantity of 1 N used in c.c.	Quantity of iodine consumed as found by residual titration in c.c. 1 N $\frac{1}{10}$.
15	·32 gram. K H O		50 c.c.	16·45
16	·56 „ K H O	25 c.c.	25 c.c.	14·72
17	·4 „ Na H O	25 c.c.	25 c.c.	14·94
18	·4 „ „	60 c.c.	25 c.c.	15·85
19	·4 „ „	„	40 c.c.	17·06
20	·4 „ „	„	35 c.c.	16·85
21	·4 „ „	„	30 c.c.	16·45
22	·2 „ „	„	35 c.c.	18·45
23	·1 „ „	„	35 c.c.	22·1†
24	·05 „ „	„	35 c.c.	21·8
25	·1 „ „	„	30 c.c.	21·8
26	None	„	25 c.c.	4·0
27	·1 gram. Na H O	30 c.c.	30 c.c.	21·5
28	As 25 with 1 gram. K O ₂ H ₃ O ₂ added	60 c.c.	30 c.c.	22·1
29	·1 gram. Na H O	„	30 c.c.	22·1§
30	·4* „ „	„	40 c.c.	17·2
31	·4† „ „	„	25 c.c.	7·5
32	·1 „ „	„	30 c.c.	10·3

Experiments 16 and 17 would seem to prove that a greater consumption takes place in presence of soda than in presence of potash; and although I am of opinion that a difference in consumption does take place one way or the other, I would not be justified in taking this as proved by the two experiments referred to, and I am of opinion that this is not the explanation (*in toto*, at all events) of the difference in the results obtained in experiments 16 and 17; but I shall not discuss this further at present.

Experiment 18 was carried out to determine whether the extent of dilution previous to the addition of iodine affected the result, and if so, to what extent; and it is seen that when the dilution is carried to about double, the consumption of iodine is increased by about 1 c.c. In a way an increase is not to be wondered at, because the final temperature, after the addition of the iodine solution, would be higher in this case than in the experiment (17), where the quantity of fluid was only a half, because the larger quantity would contain about double the quantity of active heat; but although this probably influenced it to some extent, I have shown by experiment 27 that it is considerably influenced by the mere dilution itself, but of course alkaline power again comes in here.

* Double quantity Phenol.

† Half quantity Phenol.

‡ Factor ·1188.

§ See conditions further on.

Experiments 18, 19, 20, and 21 show that for equal increments in the quantity of iodine added, namely, 5 c.c., there is a regular increase in the quantity of iodine consumed; and it is perhaps interesting to notice that this increase decreases by about a fixed quantity, namely, .2 c.c.—thus $17.06 - 16.85 = .21$; $16.85 - 16.45 = .4$, and $16.45 - 15.85 = .6$, then $.0 + .2(1) + .2 + .2 = .6$ —equal to the greatest increase. It is also interesting to notice from experiments 20, 22 and 23 that for equal divisions in the quantity of alkali used there is a corresponding increase in the quantity of iodine consumed, and that increase increases by about 2 c.c., thus $18.45 - 16.85 = 1.6$ and $22.1 - 18.45 = 3.65$, and of course $0.0 + 1.65 + 2.05 = 3.65$ —equal the greatest increase. Whether this harmony would obtain further I have not attempted to prove, but I think it would only hold within narrow limits, and I have shown by experiment 24 that it does not hold further in the case of reducing the quantity of alkali, because it is seen that instead of finding an increase of 5.65 in the consumption of iodine, we have a decrease of .3 on the greatest increase noted.

Again, comparing experiments 23, 24 and 25, we see that a decrease of .05 gram on .1 in the quantity of alkali is capable of performing the same work as a decrease of 5 c.c. on 35 c.c., in the quantity of iodine, the alkali in the latter case remaining the same. Had the materials used in the above experiments been absolutely pure, the results and generalities would have been perfectly definite; but as I explained at the beginning of the article, this might have been the case, or it might not, being desirous of testing the process under ordinary conditions, and having contented myself by proving that nothing of an interfering nature existed in the materials used, at any rate in the absence of any added substance; but after describing at length a few of the leading experiments tabulated above, I shall endeavour to show that in the experiments already discussed, a third factor at least existed, which so to speak held the balance of power, recognising of course all the other conditions of the experiments as remaining fixed.

In conducting experiment 23 it was observed that the colour of the mixture, after the addition of iodine, was decidedly brown, the brown liquid soon became apparently turbid, of a light violet colour, when viewed by reflected light, but on closer observation it was found that this was due to a beautiful fluorescence which the mixture quickly acquired, and when viewed by transmitted light, it was seen to be quite transparent, without the slightest precipitate or turbidity, and of a brown colour similar to the colour

started with. In about ten minutes, however, a light flocculent precipitate formed, apparently almost white, when viewed through the surrounding fluid, although actually of a dark mauve colour.

Experiment 25. The colour, when the addition of iodine was stopped, was in this case of a deep yellow, almost reddish yellow. The violet fluorescence above referred to, however, soon set in, the mixture, when viewed by transmitted light, was of a clear brown colour, and remained so all through, no precipitate forming previous to the addition of the acid. When the acid was added the mixture immediately assumed a clay-brown appearance, a precipitate falling out, which soon aggregated and separated in clots, the mixture assuming its usual brownish violet appearance, causing the precipitate to appear almost white, although really of a dark purple colour—the colour being quite different from that obtained in Experiment 23.

Experiment 27. In conducting this experiment a little heat was applied to the flask during the addition of the iodine solution, in order to counterbalance the deficiency in the quantity of heat due to the less quantity of fluid heated to 60° , as compared with that of Experiment 25, so that the final temperature of the mixture in the two experiments did not vary greatly. After the addition of the iodine it was strongly yellow, soon becoming deep reddish yellow, and then reddish brown (viewed by transmitted light), the fluorescence taking rather longer to develop than in 25. The mixture, however, soon assumed a dense muddy purple appearance, and a dark purple precipitate slowly fell out, the colour being darker than that of 25 and lighter than that of 23.

Experiment 28. For certain reasons potassium acetate (1 gramme) was added together with the alkali in this case. Each drop, after 29 c.c. of the iodine solution had run in, gave signs of a precipitate wanting to form, but as it became diffused, cleared up again. When the 30 c.c. was added the mixture was of a deep yellow colour, but soon became brown, and in the course of a minute or two a light flocculent precipitate separated out of a dark mauve colour. It will be seen here, and rather curiously, that 1 grm. $\text{K}\bar{\text{A}}$ has accomplished the same work as an additional 5 c.c. $\text{I}_{\gamma\text{O}}^{\text{N}}$.

Experiment 26. In the course of fifteen minutes a slight precipitate (white) collected. A very slight fluorescence was noticed.

Experiment 29. A temperature of 60°C . was maintained during the addition of the iodine, and was then kept at a temperature of 60° during thirty minutes. A purple colour soon set in after the

iodine was run in, and gradually increased till apparently quite muddy by reflected light, though quite transparent when viewed by transmitted light, and continued so during the thirty minutes, not the slightest precipitate being formed. It was then cooled to the temperature of the air, being closely watched all the while for a precipitate forming, but no change took place. It was then quite apparent that the iodine compound or compounds formed were soluble in the medium in which they were contained at any temperature between 10°C . and 65°C ., and probably at any higher temperature. Being aware from previous experiments that a precipitate was formed with a larger excess than 30 c.c. $\text{I}_{\frac{\text{N}}{100}}^{\text{N}}$ at 60°C ., under the same conditions otherwise, I added to the cold mixture about other 10 c.c. $\text{I}_{\frac{\text{N}}{100}}^{\text{N}}$, but without new result. I then heated this mixture gradually to 60° , but without change, showing generally that the excess of iodine in solution did not account for the precipitates formed, where 35 c.c. had been added at once, and that the precipitates formed in those experiments were not formed by the mere mechanical addition of iodine. The mixture was again cooled, but without change. One gramme potassium acetate was then added, but not much change took place in the cold, although it became gradually more opaque, viewed by transmitted light, the colour appearing more brownish. It was then heated gradually in a water-bath, when, at near 40°C . the first distinct indication of a precipitate was observed, and by the time 45° was reached the whole precipitate had formed. The heating was continued to 60° , the precipitate becoming more aggregated, although the general appearance of the mixture did not change. The desired point having been attained, the mixture was then cooled and titrated as usual, the combined iodine found being 22.11 c.c. $\text{I}_{\frac{\text{N}}{100}}^{\text{N}}$.

Experiments 30, 31 and 32 show that where the quantity of phenol present is reduced by a half the result does not greatly differ, but that where the quantity is doubled the iodine consumption is little increased, from which we may conclude that the phenol solution must not be stronger than 1 in about 300.

The White Precipitate.—In order to obtain a workable quantity of the white precipitate I used 2.6 gram. caustic soda, 40 c.c. of a solution of phenol (containing 2.3684 gram. in 360 c.c.), and about 160 c.c. of decinormal iodine, and from this mixture I obtained 0.687 gram. of the white precipitate. It occurred in long, white, satiny needles, with a heavy, peculiar odour, somewhat resembling iodine, but non-acrid and more offensive. The mother liquor also smelt strongly of it, and on distillation yielded a trifle. The pre-

precipitate was treated with ether, in which it readily dissolved. And it was also found to be soluble in chloroform, carbon bisulphide and benzene. On heating in a crucible it readily volatilised, first of all fusing to the liquid state. If the heat is cautiously applied, it may be almost entirely volatilised between 60° and 70° C., with very little decomposition; but if the temperature be suddenly raised, it decomposes, giving off large quantities of free iodine. The odour of its heated vapour is very sickening. It fused at 56° C. It was redissolved in absolute alcohol, and this solution yielded a residue consisting of two distinct portions. The bulk of it, the outer portion, occurred as an amorphous cake, the remainder, which only amounted to about the $\frac{1}{30}$ th part of the whole, occurred as minute transparent crystals. When the amorphous portion was treated with caustic potash it immediately dissolved, forming an oily-looking globule, which readily dissolved on the addition of more water; at the same time it lost its peculiar odour. On acidifying this solution a white precipitate again fell out. This circumstance, therefore, left little doubt but that the substance before acidification existed as its potassium salt, and the solubility of this salt in water at once accounted for the fact that the precipitate was not obtained from the iodine mixture before acidification. On treating the alkaline solution obtained as above with hydrogen peroxide, and then with dilute acid, no iodine was liberated, but when the addition of the acid was postponed for some time, a little free iodine was found. Strong sulphuric acid did not liberate iodine from the substance. Those tests sufficiently prove that the iodine did not occupy the place of the hydrogen of the (H O) group. It was readily attacked by nitric acid, decomposition taking place somewhat slowly in the cold. It was not very stable in contact with the air. The total iodine found, namely, 73 per cent., proved it to be a di-iodophenol. The crystalline portion of the precipitate contained calcium, and did not melt at or under 100° C. It very probably had a similar composition to those portions of the coloured precipitates soluble in ether, of which I shall treat further on.

Mauve-coloured Precipitate—In order to obtain a workable quantity of the dark mauve precipitate I used 0.4 gram. caustic soda, 8 grammes. potassium acetate, 20 c.c. of a solution of phenol (2.3684 gram. in 360 c.c.) and 130 c.c. decinormal iodine, and from this mixture I obtained a precipitate which weighed about 0.5 gram. The precipitate was of a dark mauve colour, having a dull, amorphous appearance. 0.2592 gram. of this precipitate was

digested with ether; the ether, drawn off and evaporated, yielded a residue which weighed .045 gram. For convenience I shall call this the ethereal extract. This extract consisted of well-formed minute crystals, somewhat tabular, some longer and some shorter, mostly of a light, reddish yellow colour, although many were quite colourless. The extract might probably have been purified by repeated crystallisation, but it was deemed sufficiently pure for my purpose.

.0325 gram. of this substance was weighed off for total iodine placed in a sealing tube with nitric acid, sealed and heated to about 200° C. for two or three hours; the liberated iodine was then dissolved out with carbon bisulphide, the solution was washed and titrated. Result showed 57.5 per cent. total iodine.

The residue remaining after digestion with ether was then treated with chloroform. The chloroform solution, on evaporation, left a small quantity of a magenta-coloured amorphous substance, which weighed .0038 gram. This substance, on incineration, showed a trace of iron. It was not further examined. The residue from the chloroform extract was then treated with carbon bisulphide, which dissolved out the greater portion of it. The solution was of a clear, magenta-brown colour, and on evaporation left a brittle, shiny, semi-transparent, magenta-brown coloured substance, resembling an iron scale preparation, which exhibited no tendency to crystallise. It weighed .1607 gram. .0325 gram. taken for total iodine showed nearly 54 per cent.

The residue from the carbon bisulphide extract was of a brown black colour, with a rough, non-reflecting surface, excepting on the side adhering to the glass, where it had a shiny appearance. It was perfectly amorphous. Weight .0486 gram. .0325 gram. taken for total iodine gave 51 per cent.

Purple-Coloured Precipitate.—To obtain a workable quantity of this precipitate (Exper. 24), I took .4 gram. caustic soda, 20 c.c. of a solution of phenol (2.3684 gram. in 360 c.c.), and 120 c.c. decinormal iodine, and from this mixture I obtained a precipitate which weighed nearly .5 gram.

.2592 gram. of this precipitate was digested with ether. The ether, drawn off and evaporated, yielded a crystalline substance of a light-red colour, which weighed .0518 gram. .0325 gram. taken for total iodine gave a little over 61 per cent.

The residue from the ethereal extract was treated with chloroform; the chloroform evaporated off, left a dark magenta-coloured amorphous substance, which weighed .0129 gram. This, on in-

cineration, also left a trace of iron. I weighed a small quantity off for total iodine, but an accident happened to the tube, and it was lost.

The residue from the chloroform extract was then treated with carbon bisulphide, which, when evaporated, left a substance having precisely the characters of the substance already described, and obtained similarly from the mauve precipitate. It weighed 1.296 gram. Portion taken for total iodine gave a little over 53 per cent. This result was checked by the lime process, and precipitation as silver iodide, which showed that the process followed was quite trustworthy. The residue still remaining after digestion with carbon bisulphide was quite similar to that already described from the "mauve" precipitate. It weighed 0.68 gram. Portion taken for total iodine gave 51.5 per cent.

On reviewing the above results it becomes apparent that the four portions obtained by the above treatment from each of the two coloured precipitates are practically the same, the slight divergences in the total iodine being quite easily accounted for when we consider that no means was adopted to absolutely separate the various extracts from the residues, and that the quantities operated on were very small to be calculated by such a process. Before I had obtained the above separations I had found by incineration of the total precipitates that they contained a considerable quantity of iron, whilst the white precipitate already considered contained only a trace, and this trace was not to be wondered at, for there is no doubt that it arose from the fact that it was contaminated slightly with one of the lower iron-containing compounds. It at once became apparent that the metal iron had been playing an important part through most or all of the experiments which I have already tabulated, and on examining the materials which I had used I found a small proportion of iron existing as contaminations in the caustic soda and potash (the potash containing the lesser quantity), the potassium iodide and the potassium acetate. Just by the way, I may, perhaps, remark that I have been rather surprised at the great number of chemical and pharmaceutical compounds which contain iron as an impurity, many of them being guaranteed pure. It is only quite recently I had occasion to examine a sample of quinine sulphate, when I was somewhat surprised to find the ash consisted almost entirely of iron. On the other hand, this is not to be greatly wondered at when we consider that iron is now much used as a purifying agent in some form or another, and that a great number of our manipulating vessels are constructed of this metal, although, I think, in the

latter case, vessels of some other ware might well be often substituted.

However, reverting to our subject, I then began to think that the presence of iron was, possibly, the cause of the colour of the precipitates, and this supposition was strengthened by the fact that the lighter the colour of the precipitate the less iron it contained; and then there was the fact that the white precipitate contained, practically, no iron, and then it was argued, how could the iodine account for it, since the coloured precipitates actually contained, weight for weight, much less iodine than the white, and the colours were probably not produced by what I may, perhaps, style the "enclusion" of iodine. Many will, doubtless, think that it would have been exceedingly easy to have proved this point by simply taking those materials absolutely free from iron, but I should advise those who think so just to try it, and if they should succeed the second time, they will probably owe their success as much to luck as to good guiding. At any rate, so my experience teaches. I tried twice, but I did not succeed in obtaining solutions absolutely free from iron. Although I did reduce the colour of the precipitates somewhat; taken altogether, the result rather negated the theory of the required presence of iron. Imbued partly with the spirit of yet proving or disproving my little whim by indirect means, and partly with the hope of placing on record a metal iodophenol compound which might prove of some service to the wants of surgery, I instituted the following experiments. In choosing a metal I hit upon Bismuth as being an element admirably fitted to satisfy the above two conditions. I experienced some little difficulty in finding means for retaining this element in alkaline solution, without introducing anything that would be likely to interfere; but ultimately I adopted the following plan—A little bismuth iodide was dissolved in excess of potassium iodide, and then a pinch of citric acid added, and finally, the alkaline phenol solution, with the result that I had a perfectly clear solution with free alkali ready to receive the decinormal iodine, which was run in under the same general conditions as before. Almost immediately it received the iodine solution, an apparently white precipitate began to fall out, and at the end of the experiment, the mixture was of a dark-brown colour, due to the excess of iodine added, but the precipitate did not alter, and little or no fluorescence was noticeable. The mixture having been acidified as usual, the precipitate was collected and dried, when it was found to possess a pinkish-white colour, and when treated with ether,

was found to be almost wholly soluble. On roughly weighing I found that it weighed nearly double that of the white precipitate, obtained with similar proportions of material, and it was almost entirely without the odour which so distinctly characterised the white substance. I shall revert to the probable composition of this substance when I deal with the others. Meantime, I ask, does this prove that iron is essential to obtain the red precipitate? I have given to the phenol compound a metal with which it is capable of forming a more insoluble compound than with iron; it therefore seizes this metal in preference to the iron, or, if you like to put it thus; the bismuth seizes the phenol before the iron gets the chance. In the first case you see the bismuth is the more acceptable suitor, in the second case bismuth appears as the victorious suitor; but after all, perhaps the case is more one of love at first sight, the bismuth and the phenol running off with each other immediately they meet. Viewed from some points, the experiment does appear to prove the point, but in any case it seems to show that the presence of some metal capable of forming an insoluble compound with the "iodophenol" is essential to this special class of reaction. I have already pointed out that no red precipitate was formed, whilst, I may remark, the iodine consumption was similar to that in which red iron precipitates were formed. Were it not for the possible probability that the very element added to excess, namely, iodine, might itself be capable of turning its coat, so to speak, and placing itself at the head of a family in which it had a real life interest, having first of all obtained a seat in the very nucleus of the family, and then assumed government of the whole concern, I should say that the above experiment conclusively proved that the presence of iron, or a similar metal, was essential to the particular class of reaction referred to, and consequently to that particular consumption of iodine, and consequently to the application of any particular numerical factor. Of course it will be apparent that only those metals capable of existing in alkaline solution can be brought within the sphere of action.

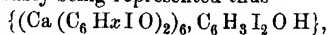
The next experiment was made in presence of zinc, but, as might be premised, the iron had the preference, so that no zinc compound was obtained. Lead was next chosen as being a likely metal to form insoluble compounds; and so it proved, it taking a place between bismuth on the one hand and iron on the other; but it lies closer to iron in this respect.

This experiment seemed to strengthen the above supposition of iodine possibly occupying the position of base, under certain

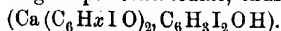
conditions, for here the precipitate was red, although less so than when iron was only present, and when the red precipitate was dried, and treated with the solvents as before, it was found the greatest part of the colour was due to the portion soluble in carbon bisulphide, whilst the residue remaining after this treatment was almost entirely an insoluble lead compound, although it was evidently contaminated with a smattering of the insoluble iron compound. Notice here that the lead compound is found in the most insoluble class, whereas the bismuth compound was found in the most soluble class, namely, that soluble in ether.

Composition of the Compounds.—I shall now deal roughly with the probable composition of the compounds. I have already treated of the white precipitate, so that I have now only to deal shortly with the separations from the coloured precipitates, together with those obtained in the supplementary experiments.

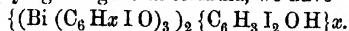
The portions soluble in ether fused readily on heating, becoming quite fluid, which then gave off a quantity of a whitish vapour having a strong, disagreeable odour, quite similar to that given off on heating the white precipitate already mentioned. The remaining portion then decomposed, and, on final incineration, left a residue containing calcium. I have already pointed out that the ethereal extract in the one case gave a little over 57 per cent. total iodine, whilst the other gave a little over 61 per cent. Taking those results together with the quantities of metal, the fact that they were both fairly well crystallised, together with the properties of the compounds which I have yet to describe, they are capable of being represented as particular cases of a general formula, which I shall afterwards adduce, the compound containing 57 per cent. iodine probably being represented thus—



and the one containing 61 per cent. iodine, thus—



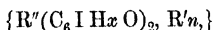
Since the bismuth compound naturally falls in here I shall at once describe it. It was amorphous, of a light-pink colour—was soluble in ether. When heated it behaved similarly to the compounds described above, but became less fluid. The iodine showed 48.5 per cent. Calculating on the strength of the iodine percentage found, and applying the general formula, we have—



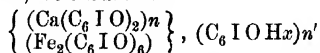
The portions soluble in chloroform, when heated, fuse to a black semifluid mass, giving off some iodine, and part with the remainder of the iodine as the temperature increases, leaving a

black carbonaceous mass, which, when incinerated, leaves a residue containing iron, probably about 0.003 per cent., together with a calcium compound. The compound was not further examined, but was probably of the general structure of the CS_2 extract, with probably a greater quantity of the molecular attachment, which would account for its fusibility.

The portion soluble in CS_2 did not fuse when heated. At a low temperature it gave off a small portion of iodine, together with some carbonaceous matter, and as the temperature was increased the remainder decomposed, the iodine coming off free, leaving a brittle, black carbonaceous mass, which, when incinerated, left a residue containing the metals iron and calcium. When boiled with well-diluted nitric acid, it lost about 2 per cent. iodine, and the residue, when distilled in the presence of iron, alum, and H_2SO_4 for over an hour, lost other 4 per cent. iodine, but slight charring seemed to have taken place. Nitric, sulphuric, and hydrochloric acids did not affect it in the cold, and nitric acid at 150°C . only slowly decomposed it. Whether this compound was a double salt I cannot say, but taking its constant composition and physical properties into consideration, it is difficult to imagine otherwise; but, looking at the extremely small quantity of iron—0.00025 per cent., if it was such a compound it could only be so in the widest sense, possibly in the molecular sense, and even then only in the widest application of that term. At all events, it is markedly illustrative of the extraordinary affinity possessed by iron compounds for organic matters in general. In any case it did not derive its iron from the compounds surrounding it mechanically, as the separations were perfectly definite. Adopting the theory that it was a double molecular compound, I shall apply a general formula, deduced more especially from a consideration of the lead salt—



R'' being any bivalent metal, and R' being a di-iododiphenol or phenolic residue, or a di-iodophenol. Now, applying this formula to the above case, we should have—

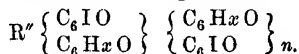


If we calculate this out, we find that, to satisfy the above percentage of iron, n and (n') (n' being much the greater quantity) requires to be represented by about 15,000. However, I have since made experiments whose precipitates yielded to carbon bisulphide extracts whose metal was nearly all iron, so that although the

general structure may be very constant, still the relative metal part seems to vary greatly, and I find that this is so in all the other extracts, chloroform sometimes dissolving out a large quantity.

The internal structure of the above general formula has been deduced from considerations which I shall introduce when dealing with the rationale.

The residue insoluble in carbon bisulphide, did not fuse when heated, and behaved otherwise like the compound just treated of. Like it, it contained the metals iron and calcium; only, the iron existed to the extent of a half per cent. The iodine found was only 51 per cent.; but this low percentage, as compared with that required by the general formula, is easily accounted for by the fact that this portion necessarily contained all the extraneous matters derived from the filter-paper and other sources—and a very small proportion of such matters in about a grain of substance would make a large difference in the calculated percentage; but it is probably also accounted for by the possibility of its being mixed with a compound of lower substitution, as I find that this residue frequently only yields a percentage of 40 to 41 total iodine, which would require a modification of the general formula, thus:—



It appears from the above that the presence of the iron compound to the extent of a half per cent. metal, united to the calcium compound, is sufficient to render the resulting compound insoluble in CS_2 . The fact that the full iron compound is not found here is probably due to the circumstance that all the iron has been removed; but the iron compound, pretty well agreeing with the formula, can be obtained by adding iron to the mixture in some suitable form; but the metal calcium seems to be a very important factor in the general reaction.

The lead compound, obtained as already described, behaved generally like the iron compound, but scintillated brilliantly for an instant during incineration. The iodine and the lead of this salt were estimated, when the following numbers were obtained:—

Lead ¹	.	.	.	.	.	.	.	18.0
Iodine	.	.	.	.	.	.	.	47.7
C + (H) + O by difference	.	.	.	.	.	.	.	34.3
								<hr/> 100.0

¹ The lead percentage is very low, but it must be remembered that it was contaminated with iron and calcium.

Now the general formula already cited requires $\{\text{Pb}(\text{C}_6\text{IO})_2, 2(\text{C}_6\text{IOH})\}$, and this, calculated out, gives—

Lead	19.5
Iodine	47.4
(C+H+O)	33.1
	<hr/>
	100.0

It may appear somewhat rash to construct a formula on such evidence, and no doubt it is so; but, after all, a C, H, and O determination would not have been of great assistance, and a combustion of such a substance would more than ordinarily have been liable to error, so that possibly a scrutiny of its deportment under the influence of heat, together with the above estimations, and a consideration of the changes necessary to be assumed in order to explain the large disappearance of iodine during the formation reaction, probably furnish fairly satisfactory data.

No doubt aluminium and many other of the heavy metals and earth metals, which are capable of existing in alkaline solution, also form similar compounds; in fact, the reaction seems to be an exceedingly delicate one, for the removal of such metals existing in alkaline solution in almost infinitesimal quantities, and there is reason to believe that the removal under such conditions is absolute.

Rationale.—When we consider the foregoing results as a whole, the rationale of the chief points in the reactions become, I think, fairly traceable. In the first case, where a large quantity of alkali was used, with a meagre excess of iodine, the foreign metals present as impurities in the caustic alkali seem to have been unable to displace the sodium or potassium, according as one or the other alkali was present, so that the iodine substitution apparently went on until the iodine solution had become too weak to displace a second atom of the small portion of phenol still existing as a mon-iodo compound, and this weakening was no doubt aided by the fact that the solution was always becoming colder; and this view is possibly supported by the fact that when the quantity of phenol present was doubled the apparent absorption was not much increased. If we calculate the quantity of iodine apparently “consumed,” we find that if the whole of the phenol present was converted into a di-iodo compound, we should still have about as much iodine unaccounted for as was substituted; therefore, any factor obtained by dividing molecules phenol by atoms iodine

must be an erroneous one, or, if it be correct, it is only so by accident. In point of fact, the quantity of iodine unaccounted for is more than that taken up by the phenol; the ratio is something like 1 to 1, and it cannot be less, however more it may be, but I have shown that it is very variable. How, then, has this iodine disappeared? A reference to the graphic¹ equation following will show that, if the reaction proceeded with perfect definiteness, for every atom of iodine substituted, two atoms are lost to the reversed reaction. But, as I have pointed out, the quantity lost is generally greater than this, and this quantity is evidently intimately connected with the degree of excess of the alkali; but even were this ratio perfectly definite, we could not construct a legitimate factor, because the phenol is converted into substitution compounds of variable degree, and those in variable proportion.

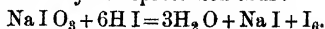
Now, turning our attention to the case where a small quantity of alkali existed together with a large excess of iodine, we are at once struck by the fact that "iodophenols" of lower substitution are actually formed than in the last case. I must account for this by assuming that as soon as one atom iodine is substituted in the molecule the conditions become favourable to the coalescence of two molecules phenol, generally both substituted, and that this coalescence is favoured by the presence of metals with which the product can combine to form more or less insoluble compounds, the displacement of the alkali metal by such metals being intimately connected with the extent to which coalescence is carried, and this is most strikingly illustrated in the presence of bismuth or lead.

On calculating roughly I find that the total iodine actually consumed by the phenol to produce the white precipitate is greater than that consumed in producing the red precipitates, whereas the total "consumption" of iodine, as found by titration, is greater in the case of the red precipitates than in that of the white; that is, we find precisely the opposite of what we should naturally expect, and this notwithstanding that the red precipitates were nearly a half heavier than the white. Of course this is partly accounted for by the fact that all the phenol compounds are not precipitated in the case of the white.

¹ The graphic representations exhibited before the Conference have been withdrawn, as any advantage gained was more than outbalanced by time and expense involved in "blocking." In them the iodate was merely represented as oxygen carrier between the phenol molecule and water. I may here remark that the interchange of phenate metals would probably also in part account for the loss.

The quantity of iodic acid existing as iodate cannot differ greatly in the two cases, because the quantity of iodine added (30 c.c.) to the mixture, where say '1 gram. caustic soda existed, was not greatly in excess of that required to saturate the caustic, and in the cases where the caustic is in excess of the iodine added, the caustic cannot take up more iodine than it actually receives; but there is reason to believe that saturation does not take place in either case, at any rate, not before the reaction is to a large extent completed. Well, then, how is the above anomaly to be accounted for? I think we must try to imagine what changes actually take place during the bombardment of the phenol molecule. Iodate must be first formed on adding iodine to the alkaline solution, because in the absence of the iodic radical (or rather the conditions necessary to the formation of) we know that substitution does not take place, and we know that for each molecule of iodate formed, five molecules of iodide are simultaneously produced. Now this quantity of iodate is in itself quite insufficient to furnish the quantity of iodine actually "consumed" by the phenol; and then, again, I have shown indirectly that iodate existed in the mixture at the end of the reaction. It then becomes apparent that since the iodate formed is insufficient, and that the reaction only takes place in presence of iodate, it therefore follows that the iodate must be maintained in existence during the reaction, either partially or entirely; but if it were maintained entirely, and nothing existed in the mixture capable of taking up iodine without the simultaneous production of iodate, and granting that the reaction was essentially the same as represented and proved in the last case, then the excess of iodine, as found by titration at the end of the reaction, would be exactly equal to the difference between the quantity actually added and twice the quantity actually consumed. But on calculating as nearly as ascertained facts would readily admit of, I find that in the last case referred to, although the figures actually found nearly agree with the above enunciation, the apparent phenol consumption is more than twice the quantity actually consumed, and in the present case it is from four to five times. Where, then, has this quantity gone to? On reviewing the graphic equation representing the last case, I think one would naturally look for a solution of the problem to hydriodic acid, momentarily formed, and this more especially since the iodine added is more than sufficient to saturate the alkali present. Granting for a moment that conditions did momentarily favour the existence of free hydriodic acid in the

mixture, we would fail by every possible method to account for the above proportion of loss, if, indeed, we succeeded in constructing an equation mathematically correct, much less in harmony with observed facts and probabilities. Even if the hydriodic acid did accumulate in sufficient quantity to decompose the iodate, the decomposition could only be represented thus:—



Then, if this iodine remained free, it would be found in the titration; if it combined with alkali, it would form the same quantity of iodate as had been decomposed, and the final result would not be changed.

I have shown that the precipitates obtained in the case under discussion contained foreign metals. Now those metals must be looked upon as saturating the phenol molecule in which they are contained, but the total quantity of metal is quite insufficient to saturate anything like the quantity of phenol molecules co-existent with it; therefore we must conclude that those extra molecules are themselves saturated and molecularly jointed to the metal compound, or that the metal compound has an extraordinary power in precipitating non-metallic phenol molecules in such a way that basic saturation cannot take place, and also an extraordinary protective power in preventing those molecules being attacked by such a strong basic re-agent as melting potash, which I have shown does not affect the compounds soluble in CS_2 , nor those in the residue remaining; whilst against this we have the fact that the compounds from ethereal solution are partially attacked by such means, which is quite in harmony with my assumption that those compounds contained di-iodo substituted non-saturated phenol molecules. To assume that the iodine falls into the place of the hydrogen of the (H O) group, as has been assumed in the case of a higher phenol of some interest pharmaceutically, is to my mind perfect nonsense, quite contrary to probability, and absolutely antagonistic to observed facts. You will remember that where the lead salt was obtained, a large excess of lead existed in the mixture. I have shown that lead forms one of the most insoluble compounds, and has a strong basic affinity for the compounds under discussion. Wherefore, is it likely that iodine, which has no basic properties, would be able to displace such a metal? But you may ask, is it not an iodide? If such a compound existed, I should call it iodine phenate.

Referring to the adaptability of this reaction to the estimation of phenol, I shall give a general answer—that no process varying

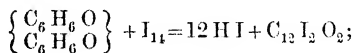
so much in itself, and influenced so greatly by so extremely small differences, is of practical value for the absolute estimation of any substance, more especially where the quantity operated on is necessarily extremely small.

This process may be used with very good results as a comparative method where the phenols estimated are comparatively pure; but I am of opinion that iodine in alkaline solution would form substitution compounds with the higher phenols more readily than bromine would in acid solution.

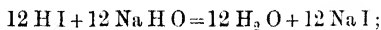
In cases where a comparative method would not be convenient, I have indicated in the tabulated results two cases under conditions which give fairly definite results, referring to Experiments 9 and 23, and I have shown how the consumption of iodine given in 23 can be made fairly regular, namely, by the addition to the alkaline solution of a slight excess of iron existing in a form compatible with the conditions of experiment, and I have appended a factor for this particular case.

In conclusion, I shall postulate what I have more or less proved indirectly, that were the materials used in the process absolutely pure, no coloured precipitate would be obtained under any conditions, and no precipitate would be formed prior to the addition of acid, and that the precipitate obtained on acidifying should be freely and wholly soluble in ether.

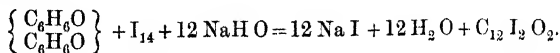
Although I have assumed by way of grounding my argument that no iodate was destroyed, which assumption was merely drawn from the fact that the quantity of iodate remaining in the second case was proportional to the quantity of iodine added relatively to the quantity added in the first case, which was not to be expected were it otherwise, since the total iodine "consumed" was so different; however, there is no need to assume that iodate is formed at all, prior to the substitution of iodine in the phenol molecule, for the reaction could easily be represented thus, so far as equations are concerned:—



then—

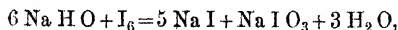


or thus—

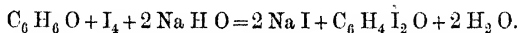


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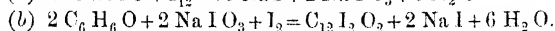
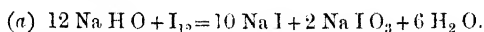
Then, as in the above case—



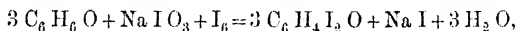
this latter addition of iodine being all returned on acidifying. Taking the first case, and where di-substitution principally takes place, we would have—



Granting that iodate is formed prior to substitution, I have shown, by performing a supplementary experiment,¹ carried out inversely, that is, I added the phenol solution to the warm solution of iodide and iodate in presence of free alkali, when I found that scarcely any substitution took place, and that what substitution did take place was again proportional in the two cases, which goes to prove that the iodate is only of use in the nascent condition, that is, its existence would merely be hypothetical, because a molecule could not exist in the nascent condition, that is, it must be decomposed at the same time as it is formed. Accepting this view, the equations could be very simply represented thus:—

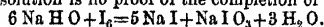


Taking the first case (di-substitution), we would have for (b)—

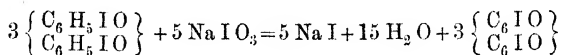


this equation representing a total iodine consumption of 4 atoms for each molecule phenol, whilst equations (a) and (b) represent a total consumption of 7 atoms iodine for each molecule phenol; and it will be found the same is true of those equations already given. As I have already stated, the two reactions always run concurrently, so that it will be readily perceived that by combining the results 4 and 7 in certain proportions, we can obtain a total iodine consumption as near to 6 as we please, or as near to any other number between 4 and 7 as we please, which bears out entirely the actual results obtained in the experiments already tabulated.

¹ This goes far to prove what I have previously hinted; namely, that decolorisation of the solution is no proof of the completion of the reaction—



Although I have chosen to represent the reactions as above, there is very great reason to believe that a true substitution compound (a true phenol) is always primarily formed, and that the molecules then condense thus:—



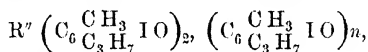
The final result is always the same, so that it is immaterial which theory we adopt, since either explains the “loss” of iodine relatively to the quantity substituted; but it is important to bear in mind this latter equation, since it furnishes evidence of the tendency to substitute in the benzene nucleus (attaching themselves directly to carbon atoms), and no amount of condensation is likely to displace the iodine atoms from the positions already taken up; and the importance of this will become apparent when dealing with complex molecules, such as aristol, of which I shall treat shortly.

Aristol.—The question, “What is aristol?” has been put and answered by different investigators, but I do not think it has been satisfactorily answered, at any rate not in all possible cases. A sample of aristol was taken and treated with ether, in which it almost all dissolved, the residue being about 5 per cent. of the whole, and consisted of the mixed iodides of calcium and sodium together with iron and filter scrapings. Of course this sample reacted for an iodide on account of the above impurities.

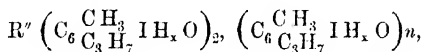
The Ethereal extract was evaporated, and a residue was obtained, which consisted of two portions of darker and lighter colour, quite amorphous. A quantity was incinerated, and a white inorganic residue remained, consisting mostly of the carbonates of calcium and sodium, together with a trace of iron. That is, the compound was more or less a metal salt. The melting point was between 155° and 160° C. When raised very slightly above the melting point, the molecule appeared to break down, a black semifluid mass resulting, which, as the temperature increased, the iodine belched out free, together with carbonaceous vapour. When treated with potash cold no change took place, but when heated gently with potash it carbonised, and the potash solution reacted for an iodide, but it only contained a very small quantity of iodine. Now if the iodine had existed, as has been averred, as an iodide, when it got hold of a part of it, it would have taken the whole of it; but it was quite apparent that the quantity taken up by the potash was proportional to the destruction of the molecule.

I should therefore conclude that the iodine was united directly to a carbon atom.

The general behaviour of this compound was quite similar to those already treated of under the second case, and the liberation of iodine was always equivalent to carbonisation or destruction of the molecule. Had it been an iodide, would this have been necessary? Again, applying the lead argument, granting the iodine did occupy such a position, if I prepare the compound in presence of an excess of lead, then I should expect that this metal would be capable of preventing iodine from assuming such an unnatural position, itself filling the place. Now, in point of fact, the bulk of the precipitate obtained under such conditions contains no lead; I have therefore a right to conclude that the iodine occupies no such position. Again, a very small portion of the above precipitate did contain lead, but it contained relatively the same quantity of iodine; how, then, could iodine and lead simultaneously occupy the same position? There is reason to believe that the compound has been erroneously represented by formulae already given by different investigators. Taking the "loss" of iodine during its formation into consideration, together with its general properties, I think the formula is more likely to be—

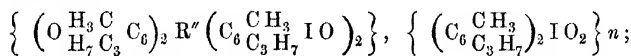


or, generally, to meet all possible cases—



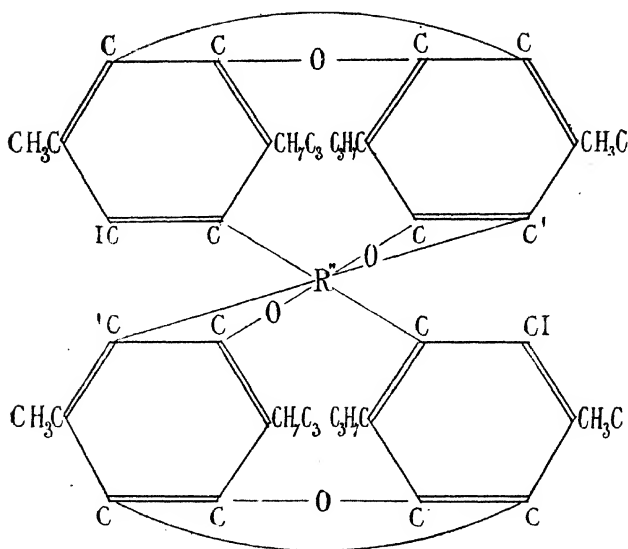
where R'' represents any bivalent metal, but may also be made up partly by monovalent metals.

But another case is possible, just as with phenol, which may be represented thus:—



and this happens to be the formula required by the sample whose properties I have described above, the total iodine only amounting to 27.4 per cent., and the metals 0.6 per cent. The highest recorded total iodine found in commercial samples of aristol is about 46 per cent., but I have shown as a general result, when dealing with phenol, that the total iodine may vary to a much greater extent by admixture with true substituted thymols, most probably those of di-substitution; but this is much less likely to

occur to any considerable extent with thymol than with phenol, because condensation takes place much more readily with thymol, which fact explains the reason why commercial aristol does not usually rise much higher than 46 per cent. in total iodine. When the sample of aristol referred to was heated under great pressure at a temperature of about 180° C., with zinc and water for about twelve hours, a considerable yield of thymol was obtained. When the aristol was boiled with moderately dilute nitric acid, an almost instantaneous liberation of iodine, attended with slight



effervescence, took place for a few seconds at first, the compound assuming a beautiful yellow colour, and thick viscid appearance. On continuing the boiling for about six hours, little change took place, the iodine being slowly liberated all the while, N O_2 probably taking its place, just as in the case of the red phenol compound, but more rapidly. The yellow substance formed as above after the first attack of the nitric acid, when taken out and boiled with successive portions of water, and dried, yielded a yellow crumply substance, which, when powdered, was of a beautiful yellow colour. The melting point was practically the same as the original substance. This small evolution of iodine might be

explained by assuming that a minute portion of the compound had had one of its lateral chains also substituted, but, as I have hinted, when dealing with the red phenol compound, that it is just possible that the compound might contain a trace of "enclused" iodine, but the original brown colour is intimately connected with the presence of a minute trace of iron, but, in any case, there is no change in the internal constitution of the compound, such as has been hinted (*Journ. Chem. Soc.*, 1889, 1150), and the brown substance is certainly not di-iodo-thymol. The substance under examination underwent no change on exposure to light, and probably never would; in fact, it can be kept for days in a mixture of equal parts of H_2SO_4 and water without undergoing change, and even strong H_2SO_4 has little action on it. No wonder, then, that medical men have published conflicting results, because, if the physiological action depends on the iodine of our ideal aristol, it is difficult to conceive how it acts.

The preceding is a graphic representation of the metal part of formula No. 2. To convert it into No. 1 it is merely necessary to place two I's for the two dashes attached to the self-saturated C's, and to convert it into the phenol residues, simply eliminate all the CH_3 and C_3H_7 groups, the opposite carbon atoms becoming mutually saturated.

When this red compound (carbon bisulphide extract) was heated under great pressure for about eight hours with zinc and water, at a temperature of about 200°C ., only partial hydrogenation had taken place, and only a comparatively small portion of iodine eliminated, the remaining compound being white and slightly fusible. It contained zinc. (I have little doubt but that phenol would have been ultimately produced.) The red compound exhibits the peculiar property of turning white almost immediately before decomposition occurs, when heated dry, and the more iron the compound contains, the more marked is this transformation. It does not regain its colour on cooling. This change of colour is very probably due to internal tension of the molecule, and is probably intimately connected with molecular combination existing between the small portion of metallic salt present and the remaining non-metallic portion; but there were some points noticed during this change which suggested that the substance probably contained a trace of "enclused" iodine, which would be by no means impossible. Melting potash in the cold has no action on it, but when heated for some time potassium iodide is obtained, the molecule at the same time destroyed.

Mr. Carswell was thanked for his paper.

At this stage the President remarked that there remained five papers on the programme to be dealt with, but in consequence of the lateness of the hour, and the pressure of business, partly of an exceptional character, he must ask leave to take them as read.

He deeply regretted the necessity of adopting that course, for they were all papers of considerable value, and he therefore commended them to their careful perusal hereafter. He moved that a vote of thanks be accorded to these gentlemen for their respective communications.

They are as follows:—

NOTES ON THE EXAMINATION OF SPURIOUS IPECACUANHA.

BY THEO. H. WARDLEWORTH.

The high prices for ipecacuanha which have ruled for some time past have produced the usual flood of consignments of so-called ipecacuanha. Some have been so palpably spurious that they have scarcely called for notice, while others have been better calculated to deceive. A recent arrival in this country, which was described as ipecacuanha, was so large, and its virtues were so loudly sung by the shippers, that it called for more than passing notice. At first sight the light-coloured, straight roots seemed to indicate that the parcel deserved slight attention. On careful examination, however, the samples were found to contain roots here and there which possessed that annulation which is so strongly characteristic of the *Cephaelis Ipecacuanha*. As the shipper claimed that the drug was largely used as ipecacuanha in Parnahiba and district, and as the quantity was so large, the writer decided to make, as far as possible, an exhaustive examination of the root. Close scrutiny proved it to be the *Ionidium Ipecacuanha*. On being subjected to the usual treatment for the extraction of emetine, etc., it yielded total alkaloids 0.62 per cent., most probably chiefly *violin*. The woody column is much thicker than that of *C. Ipecacuanha*, and the cortical tissue is much thinner; and while the Rio and Carthagena varieties of *C. Ipecacuanha* exhibit a large number of starch cells in the inner cortical tissue, there is an almost entire absence of them in the *Ionidium*, the tissue surrounding the woody tissue being cellular, without starch granules. The root varies much in thickness, and in fracture it resembled *C. Ipecacuanha* to some extent. When reduced to a fine powder it approached *pulv. ipecac.* very closely in smell and appearance, the difference being noticed mostly in the somewhat lighter colour. In face of the low percentage of total alkaloids in the *Ionidium Ipecacuanha*, it is worth while noting that Mr. M.

Conroy, in testing some recent arrivals of the Carthagena ipecacuanha, has found some to contain fully 2·6 per cent. of emetine. Looking at the meagre yield of alkaloids in *Ionidium Ipecacuanha* it would appear that in the Brazils the drug has been administered on the principle of the bread pill—if it did no good, it would do no harm. By the importer it was stated that the drug found a ready sale in Paris, and that 10 francs per kilo. could be realized for it. Inquiries have, however, failed to establish the accuracy of this statement. Meanwhile the merchants are looking for a buyer of about two tons of the so-called ipecacuanha.

Since writing the foregoing, the following note has been received in response to inquiries made by the writer:—*Ipecacuanha Pranhense* is a shrub that grows in the fields of Pranh (North Brazils). It has little or no stalk, the leaves growing close to the soil. It thrives best in masses, occupying nearly always a vast extent of ground, and is seldom found isolated. The branches measure 30 to 45 c.m. in length, and are pubescent. The leaves are pubescent also, simple, serrated, membranous, alternate, oval-lanceolate, green, with short stem. The flower is white, the fruit small, dry, deliscent, with small yellowish white seeds. The principal root is of the thickness of a goose-quill, tortuous, fibrous, marked with some circular impressions, and of a light green colour, which on drying turns to yellow or nearly white. It measures about 25 c.m., and has a nauseous smell. From the main root spring other secondary ones with the same characteristics. This ipecacuanha is picked in the winter season. The roots are used in medicine, being highly emetic and purgative—in short, it is employed for producing the same effects as ordinary ipecacuanha.

ESSENCE OF LEMON.

By ARTHUR A. BARETT,

Messina.

A few notes on the manufacture of essence of lemon will, I hope, be acceptable. In the first place we all learn in England that essence of lemon is made with an *écuelle*. Every book I can find says so, and on coming out here I was not a little surprised when I could not find a single one. The principle on which the extraction of the essence is carried on may be illustrated in this way. If you hold a piece of lemon peel up to the light, and turn

it inside out, a fine shower of mist will be seen to be forcibly ejected. This is not all oil, but a mixture of oil and water. Most people are unpleasantly acquainted with this phenomenon, though many have not actually seen it, for in peeling a lemon or orange with the fingers a little of the oil is often ejected into the eye, causing a considerable amount of pain. By turning the lemon peel inside out almost the whole of the essence is removed from the peel, for each little globule of oil appears to be surrounded by water, and the liquid which remains adherent to the peel consists principally of water. As it is impossible to turn every piece of peel actually inside out, the following method is adopted:—One man takes a lemon in his hand, and with three rapid strokes with a large knife cuts off nearly all the peel in three slices. The central portion which is left consists of most of the pulp with a little of the peel—top and bottom. This is simply pressed for making lemon juice. The slices pass to a second workman, who sits on a low chair with an ordinary common quality bath sponge, worth about 6d., in one hand. With the other he presses the slice of peel against the sponge, pressing the edges of the peel only with his fingers, the object being to press the convex piece of lemon peel as nearly flat as possible. The amount of pressure used is very slight, and at first sight it seems incredible that the oil globules can have been broken; but if you try the experiment of turning this exhausted peel inside out, nothing more can be extracted. The sponge is periodically squeezed. One man working in this way can extract about $1\frac{1}{2}$ lb. (English) essence of lemon per day. To ensure the cells being fully charged with moisture, it is usual to allow the lemons to stand in water for a short time; and I myself propose washing the lemons in a stream of running water. A second method, which, so far as I know, has not yet been published in England, originated in a clever fraud; but it is now, I believe, a thoroughly well-understood business.

A large trade has always been done here in lemon peel packed in brine, which has been exported for the manufacture of candied peel. Formerly, the peels were sent in the natural state; they are now exported with about three-fourths of the essence removed. This is accomplished as follows:—The lemon, instead of being cut as before described, is cut in two, lengthwise. Should there be any defect in the lemon, the workman contrives to cut it in such a way, that by removing a thin slice the defect is cut away and two half lemons remain, both free from blemish, and only a thin piece wasted. The pulp and a little of the white is

then cut out with a kind of spoon, care being taken not to rupture the oil-vessels of the peel. Another workman then presses the half lemon in various directions against a sponge; and though it is evident that the sponge process is rather at a disadvantage, he manages to extract about three-fourths of the total amount. The quantity of essence obtained in this way is considerable. As a consumer of candied peel I should be inclined to condemn this process; though, as I have not seen the product and compared it with that made with the oil, I cannot say that it is inferior. It is stoutly maintained that if the essence were not removed, it would be destroyed by the brine; and it is possible that there is some truth in this. As the essence made in this way is of superior quality, being made from the finest fruit, I hope it may be so.

This brings me to another point. It is generally assumed in England that all pure essence of lemon is good. This is far from being the case, and I have myself seen essence of lemon containing 15 per cent. of turpentine, which was really superior to essence of lemon made the same day in my presence, and absolutely pure. This results from the extraordinary variation in the quality of the essence made in the various months. This difference is not noticed much in England, even the best exporters having to make an average sample which they can supply all the year round. Turpentine is in large use, and is purified in a peculiar way, which I have not discovered, so as to have very little smell. One exporter is said to use ten tons per annum. Strange to say, the worst qualities of essence all go to London, Manchester, and Glasgow. English wholesale druggists in particular have an unenviable reputation here for buying low qualities. One Sicilian dealer thinks that the climate has something to do with the inability of Englishmen to distinguish between turpentine and essence. In addition to the difference depending on the season, the product of different districts varies. Experienced buyers claim to be able to distinguish the district and village in which an essence has been made, simply by smell and inspection. Testing is carried out as follows:—A sample is poured out into a tumbler and shaken up, after placing the hand on top. Great attention is then paid to the duration and size of the bubbles and froth, the colour is noted, and one smell is taken with the glass full, and another after emptying it. Turpentine will certainly be detected in this way if over 5 per cent. is present. Conducted in this way the purchase of essence of lemon is a matter requiring great judgment, and, most of it being sold by peasants in small

quantities, dealers cannot avoid sometimes buying a bad lot. If you make essence in your own works, the difficulties are not removed, only changed, the substitution of turpentine for essence by the workmen being frequent, and so contrived as to be very difficult to detect. A favourite means of bringing turpentine into the works is by means of a bladder and tube, which is carried as near as possible to the bladder with which we are all provided. It is a very easy matter to empty this and attend to the calls of nature without exciting suspicion.

The following inferior qualities of essence of lemon are distinguished here :—

Sacotte.—As soon as the essence is made it is allowed to deposit, and the clear portion poured off. There remains a deposit at the bottom, which is pressed in a small bag (sac). The essence thus obtained is considerably inferior to the bulk, and in those places where only small quantities of essence are made, and the deposits are left for some time to accumulate, the quality is extraordinarily bad. The cake which is left after expression is distilled in a very rough way, yielding lambicato or distilled oil of lemon. The whole of the distilled essence of lemon which is made in Sicily is now made in this way. Often enough the dregs have commenced to ferment, and in some cases have lost the whole of the lemon smell before being distilled.

Essence of lemon made from the rejected fruit from the warehouses. In November and December a large amount of fruit is cut and packed, but instead of being at once sent abroad, it is stored in warehouses, fruit gathered at this season having qualities which enable it to be kept longer than any other. Before sending it abroad it is all repacked, the bad and doubtful fruit being used for essence making. This essence never has the fine flavour of that made from fresh fruit, but has a flavour of its own, described as the smell of the wood (*di legno*), which is easily recognised.

In conclusion, I hope that next year I shall be able to lay before you samples of essences made by myself in the various months, and in particular to set at rest the vexed point of the specific gravity of essences generally. If any member could provide me with a rapid means of detecting turpentine, I should be much obliged to him.

CONCENTRATED OIL OF LEMON.

BY ARTHUR A. BARRETT,

Pharmaceutical Chemist, Messina.

Some considerable confusion having taken place at the last evening meeting of the Pharmaceutical Society as to this preparation, a sample of essence of lemon of ordinary strength having been exhibited as so-called "terpene-free oil of lemon," I take this, the first opportunity, of exhibiting a sample of the genuine terpene-free oil before a pharmaceutical audience. It will be desirable first of all to say a few words as to the chemistry of essence of lemon. It is generally stated that the valuable properties of essence of lemon exclusively belong to the terpenes contained in it, and the various papers which have been read before the Conference, such as the valuable one by Dr. Tilden, deal entirely with the chemistry of the terpenes. The work begun by Dr. Tilden has been further elaborated by Dr. Wallach, who is now the greatest authority on essential oils, and it has quite been proved that the terpenes of many essential oils are identical, and that the number of terpenes does not amount to more than four or five. The same terpene can be in fact obtained from such widely different essential oils as lemon, orange, caraway, and peppermint. It is clear then that the properties of the essential oils are not due to the terpenes. In the case of oil of caraway it has long been known that the flavour is due to carvol, and in the same way essence of lemon owes its value to the presence of a very small amount of a body which, in the absence of exact knowledge, I prefer to call simply concentrated essence of lemon. This body is said to have been isolated so far back as the year of the Philadelphia Exhibition, in 1876, but little was heard of it until about three years ago, since which time its use for special purposes has considerably increased, displacing the ordinary essence. As to what the constitution of the concentrated oil is, I am unable to say; having contented myself up to the present with working out a process for its manufacture. As during the coming season I shall be able to see the essence itself made, before proceeding to concentrate it, I shall be able to be certain of the absolute purity of the concentrated oil; and when that has been done, an investigation can be made with greater chance of success. With regard to the application, I do not think that concentrated oil of lemon has been used for pharmaceutical purposes so far; and, in fact,

except as a constituent of spirit of sal volatile, lemon is very little used in medicine. I think, however, it would be advantageously used in making concentrated infusion of gentian. Its principal use, so far, has been for making soluble essence of lemon and cordials, where its ready solubility in comparatively weak alcohol makes its use economical on account of a reduction in the cost of the spirit required. A great deal of mistrust in concentrated oil arises through its great concentration. As to the exact relative strength, no two opinions are exactly alike; and the article should be allowed to stand on its merits. In England, the largest proportion of concentrated oil which I ever obtained was 5 per cent.; and the average, using the best quality oil obtainable, was a little over 4 per cent. The strength may therefore be considered as twenty-four times that of essence of lemon, and if comparison is made with ordinary commercial qualities the strength is thirty times. That the use of concentrated oil will increase greatly I have no doubt, the flavour of the terpene itself being simply "greasy" and objectionable. I copy particulars of the characteristics of concentrated oil of lemon from my paper read before the Society of Chemical Industry, where also particulars of concentrated oil of limes will be found. Sp. gr., '900. Boiling point, 220° to 240° C. Solubility.—In all proportions of rectified spirit: 1 in 150 spirit, sp. gr. '900: 1 in 300 spirit, sp. gr. '905: 1 in 500 spirit, sp. gr. '920. Of these characters the specific gravity is the most important. So-called terpene-free oils of lower gravity are not completely terpene free, and being badly made, are not so satisfactory. As to the terpene separated from the essence, it is absolutely free from taste of lemon, but retains a pleasant though weak smell. The function which it serves in the ordinary essence is to confer diffusibility on the concentrated oil. For this reason the concentrated oil, freed from its terpene, is of little value in perfumery.

PRELIMINARY PROXIMATE ANALYSIS OF A SAMPLE OF COMMERCIAL MYROBALANS.

By A. CAMPBELL STARK.

The myrobalans of commerce consist of a mixture of the fruits of several species of *Terminalia*, the principal being *T. chebula*, *T. belerica*, and *T. citrina*. The fruits on which the following

analysis was performed were kindly examined for me by Mr. E. M. Holmes, who thinks they were derived from *Terminalia*, *chebula*, and *citrina*.

Myrobalans have, for a long time, been used in this country as a tanning material; and several species, particularly *T. Belerica* and *T. chebula*, are used as medicines in the East. Full descriptions of the uses of the fruits have been given by Hooper, Dymock, and others, and an analysis of the fruits of *T. Belerica* has lately been published ("Pharmacographia Indica," No. 3, 1890).

It has been suggested that commercial myrobalans would form a useful addition to our list of astringent drugs; and it is with a view of ascertaining what bodies besides tannins are present, and what advantages this drug possesses, if any, over other astringent substances, that I have attempted this analysis.

Dr. Apery (of Constantinople) has very strongly recommended the use of myrobalans in the treatment of dysentery and diarrhoea, and he declares the drug to be cholagogue. He describes its effect in the treatment of dysentery as very remarkable (*L'Union Pharmaceutique*, 1887). The same author also gives some details of analysis (*Journal de Pharmacie et Chimie*, 1888, p. 140), and states that the different varieties of fruits are all derived from the same plant, but at different stages of maturity. I have not been able to find an account of a full analysis of a sample of commercial myrobalans, although much work has been done upon the tannins present.

Analysis.

Determination of moisture :—

5·632 grammes of the finely-powdered and well-mixed drug dried, on a water-bath, lost ·355 gramme = 7·05 per cent. moisture.

Determination of ash :—

2·517 grammes of powder yielded ·058 gramme = 2·30 per cent. ash.

The ash was exhausted with water and hydrochloric acid successively, with the following result :—

Soluble in water	.	.	.	.	1·202 per cent.
Soluble in HCl	.	.	.	.	·872 "
Insoluble residue	.	.	.	.	·230 "
					2·304

The portion soluble in water (the solution was strongly alkaline) contained carbonate of potassium and chloride of sodium.

That soluble in hydrochloric acid contained oxide of iron and phosphates of calcium and magnesium.

The insoluble portion was not further examined, it was probably silica.

The ash had a slightly green appearance, but I was unable to confirm the presence of manganese.

The amount of ash is unusual, according to the figures given by Allen ("Commercial Organic Analysis," vol. iii., part i., p. 106) as to the proportion of ash usually yielded by commercial myrobalans. After four determinations, however, I am satisfied that the figures I have given are correct, for the sample under consideration.

One hundred grammes of the drug reduced to very fine powder were packed in a percolator, and extracted successively with petroleum ether, ethylic ether, alcohol (sp. gr. 810), and distilled water, the powder being dried in the air between the extractions. Four extracts were thus obtained, which were examined as follows:—

a. Petroleum ether extract.

Colour light yellow, a drop evaporated on a piece of blue paper left a slight oily stain. A few c.c. evaporated in a watch-glass, in the air, left no smell. I did not further examine this extract for volatile oil. Half the total extract, evaporated in a water-bath until the weight was constant, yielded 255 gramme = 510 per cent. of a yellow semi-solid residue, having, when warm, a strong fatty smell. This was treated with cold, absolute alcohol, when 241 gramme dissolved.

The alcoholic solution was distinctly acid to litmus and phenolphthalein. An attempt was made to titrate it with $\frac{N}{20}$ alcoholic soda, but owing to an unlucky accident, which occasioned some loss, the determination was not complete. The quantity required would not have been less than 20 c.c.

The residue was soluble in chloroform, and appeared to me to be the wax.

Petroleum ether extract contained:—

Soluble in cold alcohol (partly free fatty acid)	. . . . .	482 per cent.
Soluble in chloroform (wax)	. . . . .	428 "
		<hr/>
		910

β. Ethereal extract, 1300 c.c.

Colour light yellow. Some of the ether used, which I believed to be absolute, I subsequently found to contain a little alcohol and water.

The ether was therefore distilled off, the residual extract dried under sulphuric acid, and treated with ether (of sp. gr. 719), the portion insoluble in ether being dissolved in alcohol, and added to the alcoholic extract.

This ethereal extract still contained tannin, and I found by direct experiment that the tannin present in the drug is slightly soluble in ether of specific gravity 719.

Half this ethereal extract was distilled, and the residue, which had the peculiar smell of powdered myrobalans, dried until the weight was constant. It weighed $3.165 = 6.63$ per cent. It was treated successively with distilled water and alcohol:—

A. Soluble in water	4.04 per cent.
B. Soluble in alcohol	1.32 „
C. Insoluble in alcohol and water, soluble in ether . . . . .	.97 „

The aqueous solution A (200 c.c.) was of a light brown colour, and evidently contained tannin. On standing a few hours a white deposit fell; this was filtered off from a proportion of the liquid, and examined. It appeared to me to be gallic acid.

Ten c.c. of the solution (after re-dissolving the deposit by heat) were taken, and the tannin precipitated by solution of gelatin, avoiding excess. The mixture was filtered, and the filtrate well washed with acetic ether. The ethereal solution separated, evaporated, and the residue dried, weighed .056 gram. = 2.24 per cent. gallic acid.

The aqueous solution from this operation was examined, but I could not find anything present except a little tannin.

A portion of the solution (A) was treated with lead acetate, filtered, excess of lead removed with sulphuretted hydrogen, and the acetic acid got rid of by evaporation. Nothing but a little tannin appeared to be present in the solution.

Alcoholic solution B (100 c.c.). This was of a greenish colour, and gave evidence of containing gallic acid.

Twenty c.c. were evaporated, and the residue exhausted with boiling water, which dissolved .078 gram. = .78 per cent., soluble in hot water. This appeared to me to consist entirely of gallic acid.

The residue, .54 per cent., consisted of a soft green resin. This substance is presumably the “myrobalanine” of Dr. Apery.

The residue C, insoluble in alcohol and water, = .97 per cent. (by difference), was re-dissolved in ether and the solution again evaporated. It was of a brown colour, and had the characters of an indifferent resin.

All the solutions mentioned above were examined for alkaloid, bitter principle, glucoside, or sugar without result.

The ethereal extract contained—

Gallic acid	3.02 per cent.
Tannins	1.80 „
Green resin, soluble in alcohol . . . . .	.54 „
Brown resin, soluble in ether . . . . .	.97 „

γ. Alcoholic extract, 1500 c.c.

This was of a dark brown colour, and deposited slightly on standing.

Fifteen c.c. evaporated, and the residue dried until the weight was constant, weighed .251 gramme = 25.1 per cent. matter soluble in alcohol.

One hundred and fifty c.c. of the alcoholic extract were taken and evaporated at a low temperature (below 80° C.) until all the alcohol was driven off, the residue filtered, and the filtrate made up with washings to 150 c.c.

Fifteen c.c. of this solution evaporated, and the residue dried weighed .231 gramme = 23.1 per cent., soluble in water.

Examination for Tannin.—15 c.c. of the aqueous solution were precipitated with acetate of lead; the precipitate, rapidly washed and dried, weighed .336 gramme. The precipitate, incinerated and heated in the blowpipe flame until the weight was constant, weighed .119 gramme = 20.7 per cent. matter precipitated by acetate of lead.

Fifteen c.c. of the aqueous solution precipitated in the same manner with acetate of copper gave a precipitate weighing .249, and a residue after heating of .061 gramme = 18.8 per cent. tannin, etc., precipitated by acetate of copper.

The matter (1.9 per cent.) precipitated by lead acetate, but not by copper acetate, I believe to contain a bitter principle. Its examination is reserved for the sequel to this paper.

Myrobalans, as is well known, contain both ellago and gallo-tannic acids. Much work has been done on the former by Loëwe and others.

The percentage of tannins found in the sample of myrobalans

under consideration (20·6 per cent.) is low, since Allen and others give the average proportion of tannin in myrobalans as from 20 to 40 per cent. My figures represent the mean of four estimations.

Determination of Glucose.—The filtrate left from the precipitation by lead reduced Fehling's solution (after removal of the excess of lead acetate from the solution).

On determination 1 c.c. of Fehling's solution was decomposed by 6·6 of the filtrate = 1·13 per cent. glucose.

Determination of Saccharose.—A portion of the filtrate was boiled with 2 per cent. of hydrochloric acid for half an hour, and the solution estimated by Fehling's reagent = 1·25 per cent. saccharose and other carbohydrates.

The residue insoluble in water from the alcohol extract was treated with dilute ammonia (1 in 60) as long as anything was removed; the filtrate rendered slightly acid with acetic acid, evaporated, washed and dried, weighed ·086 gramme = ·86 per cent. phlobaphane.

The washings from this operation evaporated, left a dark brown residue, weighing ·035 gramme. It was freely soluble in water, gave no precipitate with gelatin, had no taste, and seemed to me to be a colouring matter.

The residue from the treatment with ammonia was of a pale green colour; it weighed ·071 = ·71 per cent.

It was insoluble in ether, alcohol, or chloroform, freely soluble in dilute caustic soda. the solution being a dark greenish brown colour.

8. Aqueous extract, 1500 c.c.

This was of a very dark brown colour.

15 c.c. evaporated and dried weighed ·051 = 5·1 per cent. of matter soluble in water.

I regret that great pressure of business compels me to defer the examination of this solution until later on.

It will be understood that the foregoing details merely represent a preliminary examination of the chief constituents of commercial myrobalans. I trust to be able to publish further details shortly. The following list, therefore, represents only the substance contained in the various extracts in general terms:—

Moisture	7.05
Ash soluble in water	1.202
Ash soluble in HCl . . . . .	.872
Insoluble ash (silica?) . . . . .	.230
Fatty matter (partly free fatty acid) . . . . .	.482
Fatty matter (soluble in chloroform wax?) . . . . .	.028
Gallic acid	3.020
Green resin, soluble in alcohol . . . . .	.540
Brown resinous matter, soluble in ether . . . . .	.970
Tannins precipitated by acetate of copper	20.600
Matter precipitated by lead, not by copper acetate (containing bitter principle?)	1.900
Glucose	1.130
Saccharose and other carbohydrates	1.250
Phlobaphene . . . . .	.860
Brown colouring matter, soluble in water . . . . .	.350
Green resinous matter, insoluble in alcohol, ether, and chloroform, soluble in caustic soda . . . . .	.710
Loss . . . . .	.100
Total matter soluble in water	5.100
Residue unexamined	53.606

103.

NOTE UPON LYCOPERSICON ESCULENTUM.

By FREDERICK DAVIS.

Hitherto I believe no complete qualitative analysis of the tomato has been published, and, indeed, the present communication cannot be considered complete in every detail, but merely a step in the right direction as a link in the chain of evidence proving the dietetic value of this fruit. I find upon referring to a large number of standard works dealing with botany and materia medica, the various authors appear to be of opinion that the active principle is malic acid, whilst a few of these authors make no mention whatever of any active principle; however, from observations and experimental work, I am in a position to place before you the fact that a substance other than malic acid, which probably influences its therapeutic action, may be obtained from the tomato. Indeed, if we take English-grown tomatoes and subject them to distillation with water, it will be found that a volatile substance analogous to oil of onions or garlic will be found in the condenser. I have endeavoured by every available means to find

this volatile oil in tomatoes uncooked, and not subjected either to the action of heat or any chemical process, but in this I have utterly failed. I assume, therefore, this substance is produced only in the presence of water and an increased temperature, very much in the same manner as we know the pungency or activity of mustard or horseradish is produced.

The method of procedure was as follows:—

Twenty-eight pounds of English-grown tomatoes were sliced, placed in a retort, and distilled with water. In a very short time a distinct alliaceous odour could be detected in the condenser, which, as the temperature was raised, became so apparent that no doubt could exist as to its presence. It appeared, however, the volatile oil developed in such a small quantity that it became necessary to operate upon more tomatoes in a like manner.

The crude oil thus obtained consisted of oxide and sulphide of allyl. The crude oil was then acted upon by metallic potassium to separate the oxygenated product, and the pure oil removed; this upon analysis proved to be represented by the formula $(C_3H_5)_2S$.

To prove that no doubt could possibly exist concerning the identity of this substance, the oil thus obtained was treated with chloride of mercury and sulphocyanide of potassium, and heated; the result proved to be mustard oil, showing positively the relation of this oil of tomatoes to be similar in position to that of oil of garlic, and to hold the same relative position with regard to oil of mustard, for upon treating the oil of mustard obtained in the manner previously described with quicklime and hydrate of sodium, and heating in a sealed tube to $256^\circ F.$, oxide of allyl was produced, together with sulphocyanide of sodium,—the oxide of allyl present being, of course, merely the oxygenated crude oil.

GENERAL BUSINESS.

Presentation from the Bell and Hills' Fund.

The PRESIDENT said it was now his pleasing duty to present the books from the Bell and Hills' Fund. The late Mr. T. Hyde Hills left a certain sum of money to be expended annually in books, to be presented to the town in which the Conference met, and although he had passed away, his name, with that of Jacob Bell, would be perpetuated in this way. He might remind them that

for the first time since the death of Jacob Bell there was a retail chemist (Mr. Townsend, Bristol) in the House of Commons, and he should advise those who had grievances to communicate with him.

The books were then presented to Mr. Laidlaw Ewing, as Chairman of the North British Branch of the Pharmaceutical Society, to be placed in the Library in York Place.

MR. LAIDLAW EWING, on behalf of the local chemists, accepted the gift and thanked the President. He was glad to say that the Library in York Place was very largely used, not only by chemists in Edinburgh but in all parts of Scotland, and by many members of the medical profession. He should like to say that no English pharmacist who ever came north of the Tweed was so much beloved as Thomas Hyde Hills.

The Unofficial Formulary Committee.

MR. BRANSON (Leeds) moved the re-appointment of the Unofficial Formulary Committee. The work had been well done, and they could not do better than re-appoint the same gentlemen.

MR. MASON seconded the motion, which was carried unanimously.

Mr. Payne's Motion.

MR. J. C. C. PAYNE (Belfast), in moving the resolution of which he had given notice, said he represented a country which was always supposed to be giving trouble, but the fact was, Irishmen were only troublesome when they had a grievance; when it was rectified, they were as contented as possible. Now, he thought the Conference had a grievance, inasmuch as there appeared to be an unwritten law that it should meet at the same time and place as the British Association. The result was they found themselves crowded out, not only out of the hotels, but out of the press, very little notice being taken of the papers, which were often well worth the attention of the general public. The matter had been talked about several times, but it always seemed to end in talk, and each year they found themselves in the same condition. At the Leeds meeting there was a sort of intimation given from the chair that the question should be considered by the Executive, and he was surprised to find at the Cardiff meeting that it was not brought forward. He thereupon, with the view of having it thoroughly discussed at the present meeting, handed in

a notice of motion; and as the matter had been before the members for a whole year, he hoped it would now be thoroughly thrashed out. One question was whether, if they separated from the British Association, they could have a successful meeting. Some were members of both Associations, and might find it difficult to attend both meetings if they were held in different towns; but the question of the meeting being successful, if held at a different time from that of the British Association, hardly required much consideration, the present meeting, held nearly a fortnight after that of the British Association, being one of the largest on record during the last twelve years. From 1882-92 the largest meeting was at Manchester, in 1887, when there were 228 present, the present being the next largest, when there were over 200. Of course he did not wish to indicate any want of respect for Nottingham, where the British Association was to meet next year, but if they met in the same town he hoped it would be at a different date. He should be quite willing to accept any modification desired in the form of the resolution, but as he had framed it, it ran :—

“That in future the Conference do not meet in the same town or at the same time as the British Association.”

Mr. HODGKIN said he would second the motion if the words “of necessity” were inserted after the words “do not.” It had been often a grievance that sufficient hotel accommodation could not be obtained, and he thought the Conference was of quite sufficient importance to stand by itself, without being tacked on to the British Association.

Mr. PAYNE said he would accept the modification suggested.

Mr. E. H. BUTLER (Leicester) supported the motion. He did not see why they should allow themselves to be dragged at the tail of the British Association. He flattered himself that wherever the Conference went it would meet with the reception it deserved. The last notice of the Conference in the *Times* was when it met at Hastings, when there was no British Association to overshadow it.

The PRESIDENT reminded the members that the Pharmaceutical Conference undoubtedly arose out of the British Association, and had been attached to it for many years. He had always thought that there was a considerable amount of inconvenience from the two meetings clashing, and this year they had made a step in the

right direction. He was glad Mr. Payne had accepted the suggested amendment, because if it were laid down positively that they were not to go to the same place as the British Association they might be in an awkward position. They were only invited to one place generally, and they could not very well go where they were not invited. He had a very pleasing recollection of the visit to Dublin, and should be delighted to go to Ireland again, but as yet they had not been invited.

Mr. MACKENZIE, having ascertained from the President that there was no resolution on record binding the Conference to meet at the same time and place as the British Association, said he did not see the necessity for the proposed resolution as amended. They were quite free already to go where they liked.

Mr. REYNOLDS said if there were any rule which prevented the free choice of a place of meeting by the Conference the Executive would be the first to advocate its repeal, because experience had shown that inconvenience was sometimes occasioned by the present practice. The only rule, however, affecting the question was this :—"At each Conference it shall be determined at what place and time to hold that of next year." It was simply precedent which had led them to follow the British Association. There was no doubt that difficulties had arisen from going to towns which were not large enough to accommodate both bodies at the same time, and although he was one of those most prejudiced in favour of the old system, having been connected with it so long, he recognised fully that grave inconvenience had sometimes arisen. He did not, however, see any necessity for passing a resolution or making a new rule. There would be an invitation presented from Nottingham, and it might be left to the Local Committee and the Executive to fix on the most convenient time. If there were any feeling that the Executive was likely to go wrong, he should not object to the resolution being passed.

Mr. PAYNE said he remembered some fourteen or fifteen years ago asking some members of the Executive whether it would be any use his giving an invitation to come to Belfast the following year, which he was authorised to do, and the reply then was that there was an unwritten law, according to which the Conference always went with the British Association. If there were such an unwritten law, it was better to repeal it by passing the resolution.

The PRESIDENT said the Executive had full power, and, since the time Mr. Payne referred to, had broken through the unwritten rule three times.

Mr. TAYLOR suggested that the resolution should be withdrawn. He quite agreed with it, and did not want to vote against it, but thought it was unnecessary.

Mr. CONROY thought it had better be put, in order to test the feeling of the meeting.

Mr. REYNOLDS moved the previous question, as he thought the resolution unnecessary, but did so in the most friendly spirit to Mr. Payne and his supporters.

Mr. MACKENZIE seconded the amendment.

Mr. MARTINDALE pointed out that when the British Association went to Belfast the Conference met in London.

Mr. PAYNE said at that time pharmacy in Ireland was in such a condition that an invitation could not be sent.

The previous question was then put and negatived, and Mr. Payne's resolution, as amended by Mr. Hodgkin, was put and carried.

Place of Meeting for 1893.

Mr. BOLTON said he was deputed by the Nottingham and Notts Chemists' Association and the trade generally, to invite the Conference to meet in Nottingham next year, when he trusted it would be at the head, not at the tail, of the British Association. He regretted that the Mayor of Nottingham was unable to be present personally to convey the invitation, but his public duties prevented him; at the same time, he had instructed him (Mr. Bolton) to express on his behalf the hope that the invitation would be accepted. In the twenty-seven years which had elapsed since the Conference last met in Nottingham, many changes had taken place, and a good many of the older men had passed away, but others had taken their places, and they would endeavour to make the meeting a success. Nottingham had lately entertained the British Medical Congress, and there was no doubt that many of the visitors before they came had little idea of the importance of the town. Twenty-seven years ago the population was only 80,000, now it was between 230,000 and 240,000. It boasted a castle and an art museum, and above all a university college, the only one in the kingdom founded by the people and managed by the corporation of the borough. It was already getting rather too small for their requirements, and at a recent presentation to the town clerk, Alderman Goldsmith said they would soon have to impose some conditions to secure that only the most promising students should partake of its advantages.

Mr. GILL, in seconding the invitation, said he hoped there would be a large number of ladies present next year. Nottingham was noted for its lace manufacture, and there were many of the stately homes of England and other objects of interest within easy reach.

Mr. R. H. DAVIES (Treasurer) moved that the invitation so cordially given be accepted.

Mr. ABRAHAM seconded the motion, which was carried unanimously.

The PRESIDENT, in reply to Mr. Mackenzie, said the date of meeting would be fixed by the Executive and the Local Committee.

ELECTION OF OFFICERS.

Mr. NAYLOR (Hon. Sec.) read the following list of officers for the ensuing year:—

President.—Octavius Corder, Norwich.

Vice-Presidents.—M. Carteighe, F.I.C., F.C.S., London; J. L. Ewing, Edinburgh; W. Hayes, Dublin; R. FitzHugh, Nottingham.

Treasurer.—R. H. Davies, F.I.C., F.C.S., London.

Honorary General Secretaries.—W. A. H. Naylor, F.I.C., F.C.S., London; F. Ransom, F.C.S., Hitchin.

Honorary Local Secretary.—C. A. Bolton, Nottingham.

Other Members of the Executive Committee.—Peter Boa, Edinburgh; D. B. Dott, F.R.S.E., Edinburgh; A. W. Gerrard, F.C.S., London; W. Gill, Nottingham; J. Hodgkin, F.I.C., F.C.S., London; E. M. Holmes, F.L.S., London; A. H. Mason, F.C.S., F.R.M.S., London; J. C. C. Payne, Belfast; R. Wright, Buxton.

Auditors.—Thomas Thompson, Edinburgh; John Wilford, Nottingham.

It was moved by Mr. R. REYNOLDS and carried unanimously.

VOTES OF THANKS.

Mr. S. R. ATKINS moved,—

“That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the local Committee, and especially to the local Secretary, Mr. Peter Boa, to the Chairman, Mr. J. R. Young, and the

Vice-Chairman, of the local Committee, and President of the Executive of the North British Branch, Mr. Ewing, for the very successful manner in which the arrangements connected with the Edinburgh visit had been carried out."

It would be impossible at that late hour even to indicate what he wished to say. The meetings had been a great success in every way, and, in particular, he must refer to the very graceful attention which had been paid to the lady visitors. There were two things necessary to secure the success of such a meeting: first, prevision, to forecast what was needed, and then provision for those requirements; and in every respect this had been done. He had attended twenty-one meetings out of twenty-nine, and could only say that Edinburgh had fully maintained its high reputation. He had just been to see Mr. Young, and was glad to say he found him bright and cheerful, and only regretting that he could not be present.

Mr. CONROY seconded the motion, saying he had never attended a Conference where all the arrangements were so well carried out.

The vote was carried by acclamation.

Mr. LAIDLAW EWING thanked the members very heartily for the appreciation they had shown of the efforts of the Committee.

Mr. BOA also responded, saying that a great deal of the work for which he got the credit was really performed by others, in particular by Mr. Maclaren, Mr. Thomson, and Mr. Aitken, the conveners of the sub-Committees, who had all worked together most harmoniously.

Mr. MARTINDALE proposed a vote of thanks to the authorities of Edinburgh University for the permission accorded to visit and inspect that renowned institution.

Mr. W. G. CROSS seconded the motion, which was carried unanimously.

Mr. GROVES then proposed a vote of thanks to the President. He had attended the greater number of the meetings, but had never sat under an abler or more genial chairman, and it was quite a matter of astonishment to him that Mr. Stanford, who been so long divorced from pharmacy, should have been able to conduct the proceedings with such skill.

Dr. INGLIS CLARK, in seconding the motion, said it was no easy task to perform, in an ideal manner, the duties of President. It

required business tact, energy, and a certain amount of physical endurance, for all of which Mr. Stanford had been conspicuous.

The motion was carried by acclamation.

The PRESIDENT, in responding, said he was very grateful for the compliment. The members owed him nothing, but he owed them a great deal, and especially to the two permanent secretaries, without whose aid he should have been helpless, but whose knowledge of the business was such that he was quite sure they could turn any one into a good working President in ten minutes.

Mr. MARTINDALE proposed a vote of thanks to Mr. Naylor and Mr. Ransom, which was seconded by Mr. Atkins, and carried unanimously, and this terminated the proceedings.

RECEPTION AND CONVERSAZIONE.

On Monday evening a Reception was held in the Burns Hall of the Waterloo Rooms, which was attended by about four hundred ladies and gentlemen. The guests were welcomed by the President and by Mr. J. L. Ewing, Vice-Chairman of the Local Committee, who were accompanied by Mrs. and the Misses Stanford and Mrs. Ewing. An enjoyable *Conversazione* followed, during which an excellent programme of music was delightfully rendered by a small orchestra, songs and duets being also sung at intervals. Frequent encores testified to the appreciation with which this part of the proceedings was received.

The popularity of the Conference in Edinburgh was evidenced by the very large number of local pharmacists who were present, and the buzz of conversation which prevailed showed that old acquaintanceships were being renewed, and new friendships formed with fellow-pharmacists, who had come from all parts of the kingdom, all three nationalities being well represented.

The only regrettable circumstance in connection with the gathering was the absence, on account of illness, of the genial Chairman of the Local Committee, Mr. J. R. Young.

After spending a most enjoyable evening, the company dispersed about half-past ten o'clock.

THE EXCURSIONS.

Six excursions were held in connection with this meeting of the Conference, three of which were specially arranged for the entertainment of lady visitors, and were held while the Conference proceedings were going on.

THE CASTLE AND ST. GILES' CATHEDRAL.

The first of these was on Tuesday forenoon, when forty ladies started in highland brakes from the Waterloo for a drive through the city. Mrs. Inglis Clark and Miss Dott accompanied the party as guides, and two gentlemen from the local Committee acted as escort. The weather was dry and cool, the only drawback being a Scotch mist which somewhat limited the view. Driving by way of Princes Street, the Mound, and the Lawnmarket, a stoppage was first made at the Castle, over which the party were conducted. The Argyle Tower and Battery; the ancient regalia of Scotland in the Crown Room; Queen Mary's Room, where James VI. of Scotland and I. of England were born; the ancient Parliament House; St. Margaret's Chapel, the oldest ecclesiastical edifice in Scotland; and Mons Meg, an ancient cannon, were in turn visited; and after enjoying a beautiful although limited view of the city from the ramparts, the party returned to the Lawnmarket. Down this street they proceeded on foot to Parliament Square, the guides pointing out on the way the various interesting buildings, "closes," and sites of historic scenes, with which this part of the city abounds. Crossing the Square, the Courts of Justiciary were entered, and a visit paid to the old Parliamentary Hall. In this Hall the Scottish Parliament met from 1640 until 1707, when the Union took place. It is 122 feet long and 49 feet wide, and its magnificently carved oak roof and inlaid floor, as well as the numerous statues and oil paintings of notable legal luminaries which it contains, were much admired. The party next proceeded to St. Giles' Cathedral, which as a church dates back to the year 854. The site of Jenny Geddes' escapade, the part of the building where the Solemn League and Covenant was sworn to and subscribed by the Scottish Parliament in 1643, and several beautiful pieces of sculpture work were pointed out; but amongst the many interesting objects to be seen, perhaps the old flags of the Scottish regiments, tattered and torn by shot and shell, attracted most attention. These relics of many a fierce

battle now find a quiet resting-place here. They have been placed round the tops of the cathedral pillars.

Resuming their seats in the brakes, the party returned to the Waterloo by way of the North Bridge.

HOLYROOD PALACE.

After lunch a visit was paid to Holyrood Palace. Driving by way of the North Bridge, High Street, and Canongate, the ladies had an opportunity of seeing Allan Ramsay's house, Blackfriars Wynd, John Knox's house, the ancient Tolbooth, with its quaint clock and tower; Moray House, formerly the residence of the Earl of Moray, now the Free Church Training College; Queensberry House, the ancient seat of the Earl of that name, now a Night Asylum for the Destitute, and various historic "closes" and wynds. Holyrood Palace was reached shortly after 3 o'clock. The picture gallery, Darnley's rooms, Queen Mary's rooms, the beautiful nave of the ruined Abbey, and the Chapel Royal were duly inspected, the Palace officials courteously conducting the party over the building.

Seats being resumed, the Waterloo was reached in time for the afternoon excursion.

ROSLIN.

At 4 o'clock eight highland coaches conveyed about 230 members and friends to Roslin, in order to visit its far-famed chapel. The weather was still favourable, and the drive by Newington, Liberton Hill, and Straiton—famous for its oil works—was much enjoyed. The rendezvous was reached in about an hour, and while one half of the excursionists sat down to an excellent tea in the Royal Hotel, the remainder, taking tea later on, visited the chapel. Over this interesting and beautiful building the party were conducted by the keeper, who afterwards, requesting all to be seated in the pews, gave a most interesting historical sketch of the building. The richly sculptured roof, the "Prentice Pillar," and the beautifully stained glass windows were especially admired.

After a peep down the richly wooded valley of the Esk, with classic Hawthornden in the distance, the excursionists resealed themselves, and drove back to town by the Pentland Hills and Morningside route. An opportunity was thus given of viewing the city from the south-west; but unfortunately, owing to the haze, this lovely view was somewhat spoiled, and the party had

to content themselves with "missing the view and viewing the mist."

The Waterloo was reached shortly before 9 o'clock, after a pleasant drive.

THE BOTANIC GARDENS, ETC.

On Wednesday the ladies had another little excursion all to themselves. This again partook of the nature of a drive, the object being to visit the Royal Botanic Gardens, the Arboretum, the new Northern Park, and Fettes College. Mr. J. Rutherford Hill escorted the party, and acted as guide. Proceeding by way of Princes Street, St. Andrew Square—one of the finest in the city, and York Place—where the Pharmaceutical Society's House was pointed out, the company alighted at the Inverleith entrance to the Gardens, where they were received by Mr. Richardson, assistant curator. Mr. Hill conducted the party in turn through the museum, hot-houses, and palm-houses, pointing out many rare and interesting plants and flowers. Next, traversing the beautifully laid out and well wooded grounds, a visit was made to the Rock Garden. Two thousand five hundred species and varieties of Alpine and dwarf herbaceous plants, collected from all parts of the world, are here laid out. The garden is formed of artificial terraces and ornamental mounds, and is always a pretty sight. From the Arboretum a fine view of the northern part of the city was obtained, and through it and the Northern Park the party proceeded to Fettes College. This large building possesses architectural features of great beauty, and having a lovely situation, it forms a striking feature of the scenery of the north side. After enjoying the view, seats were retaken, and the party returned to the city, one half being conveyed to Mrs. James Buchanan's, Oswald House, and the other half to Mrs. Brown's, Willowbrae House, where in each case they were cordially welcomed and entertained to luncheon.

THE FORTH BRIDGE.

The second of the afternoon excursions started at 4 p.m., and, as on the previous day, about 230 took seats in the brakes. Proceeding by way of Inverleith Row and the Ferry Road, the excursionists drove to Inveralmond House, Cramond, where they were hospitably entertained to tea by Mr. and Mrs. George D. Mackay. Shortly after restarting, the beautiful grounds and woods of

Dalmeny were entered, permission to pass through which having been kindly granted by the Earl of Rosebery. Regaining the public road at the West Lodge, the excursionists soon passed under the southern end of the Forth Bridge, which, at the height of 150 feet, here spans the roadway. At Queensferry pier a small steamer was waiting, which conveyed parties of forty at a time underneath the great bridge. Passing under the first cantilever, the steamer proceeded as far as the island of Inchgarvie, and a splendid view of the immense structure was thus obtained.

At 6.45 a restart was made homewards, where all arrived safely about 9 o'clock, in time for the evening festivities.

KILLIN.

At 9 a.m. on Thursday, 290 members and friends assembled at Princes Street Station and took their seats in a special train. Before starting, an endeavour was made to place a local gentleman in every carriage to point out the chief places of interest, and each excursionist was presented with a neat illustrated guide to the route, which had been specially written for the excursion by Miss Dott. The day was again fine, and the atmosphere clear, which was most fortunate, as the excursion was to pass through some of the finest scenery of the Perthshire Highlands.

The outlook, as far as Stirling, is of the usual lowland character, and apart from Corstorphine Hill on the right, the Pentland Hills on the left, the old ruins of Niddrie Castle and of Linlithgow Palace, the famous Carron Iron Works, the battlefield of Bannockburn, and the glimpses which are now and again to be had of the Firth of Forth, with the Fifeshire and Perthshire hills in the background, there was not much to attract the attention of the visitors. At the town of Stirling, the picturesquely situated Castle, the ancient Abbey of Cambuskenneth, and the Abbey Craig, on which the Wallace Monument is built, were pointed out. The finely situated health resort of Bridge of Allan was next seen, and ascending the banks of the Allan Water and the River Forth, Dunblane with its Cathedral and the old Castle of Doune were successively passed.

When Callander was reached, the country entirely lost its lowland character, and scenery, essentially highland, absorbed the attention of all. The maple and beech gave place to the pine and the fir, and banks of bracken and fern delighted the eye as every now and again the train passed through some woody copse or

fairy-like glen. Distant views of the panorama of hills, which embraces Ben Venue, Ben A'an, and Ben Lomond, were now and again seen, and soon the train passed close to Ben Ledi, 3,000 feet in height, a fine view from base to summit being obtained of this noted mountain. On the Pass of Leny being reached, the region immortalized by Sir Walter Scott in his "Lady of the Lake" was entered, and from here to Killin the outlook was of such a beautiful and enchanting character that it called forth frequent expressions of surprise and delight. As the river Teith, which winds through the Pass, was crossed and recrossed, the excursionists obtained fine views of this truly Scottish river, which, being in partial flood, dashed itself into foam as it passed rapidly over its rocky bed. Emerging from the wooded pass, the lovely waters of Loch Lubnaig next delighted the eye, and further on the pretty village of Strathyre was reached. The Braes of Balquhiddy were now seen on the left, and the lofty summit of Ben Voirlach, 3,300 feet in height, on the right. Looking up the glen towards Loch Voil, a clump of trees was pointed out, behind which stands Balquhiddy Church, where the mortal remains of Rob Roy, his wife, and two sons now peacefully rest. At this point the railway leaves the valleys and, gradually ascending, takes its course along the hill sides, until when near Lochearnhead it reaches a height of 300 feet above that village. When the train reached this vantage ground a magnificent panorama of lake, mountain, and glen came into view, and the day being bright and clear, the lovely landscape was seen at its best. The quiet beauty of Loch Earn was especially admired as it lay like a lake of silver in the valley beneath. Sweeping round the hillside, the railway now entered the gloomy Glen Ogle, and the scene changed from one of peaceful picturesqueness to one of wild grandeur. The mountains are bare and rocky, and down their sides tiny rivulets dashed themselves into foam as they descended, forming a series of miniature cascades. Near the top of the glen the mountains close in, until, when passing along under the shadow of huge rocks, which seem about to topple down on the slowly ascending train, it would be difficult to say whether the excursionists were most impressed by the grandeur of the outlook, or awed by the dangers which seemed to threaten them. At the top a small loch was passed, which is important in respect that, while its waters ultimately flow into the Firth of Tay, rivulets rising near it find their way to the Firth of Forth. It also marked the highest point to which the train ascended. Again curving round a hillside, the excursionists

passed into Glen Dochart, where another panorama of hills presented itself. The valley is wide, and the view opens up all round. To the west the mighty Ben More and many more Bens encircle the horizon, while looking eastwards the excursionists obtained a first glimpse of Loch Tay, as it lay about six miles off, nestling at the foot of Ben Lawers (3,986 feet). A rapid descent was now made, but before reaching their destination the excursionists had a view of the Falls of Dochart. Flowing through a narrow gorge, the river precipitates itself with great force over a series of rocky ledges, until, by the time it reaches Killin Bridge, it is a seething, foaming mass of rushing water. The river being in flood, this fine sight was revisited by many during the afternoon. Killin station was soon reached, and the company made their way on foot to Finlarig Castle, but they had not proceeded far when they were met by three of the Breadalbane pipers with their bagpipes. These, heading the procession, enlivened the rest of the way with "The Highlander's March." Photographing operations occupied some little time, and then luncheon was served in a large marquee. Mr. J. L. Ewing occupied the chair, and he was supported by the President and other officials of the Conference.

The usual toasts and votes of thanks followed, and these were heartily responded to, more especially that of "The Earl and Countess of Breadalbane," to whom the Conference were indebted for permission to picnic at Finlarig.

Luncheon over, a large number took their way to the pier, from which a small steamer made hourly sailings during the afternoon, and, needless to say, the lovely scenery of Loch Tay was much admired.

Other parties were separately taken over the castle and grounds by Pipe-Major Campbell and his wife, who acted as guides. The most interesting objects were, "The Gallow's Tree," the place of execution, the mausoleum of the Breadalbane family, and several ancient trees. Others set out to visit the Falls of Lochay, in the neighbourhood, while not a few walked to Achmore House, where the largest vine in Britain is growing. On this vine the extraordinary number of 4,520 bunches of grapes have grown this year. It is 61 years old, and is 206 feet in length.

At half-past four tea was served in the marquee, after which all wended their way to the station, delighted with what they had seen, and only regretting that time did not permit of a longer stay.

After a quick run home, during which the various hills and

landscapes were seen in a different light, the excursionists arrived safely at Princes Street Station about nine o'clock, all feeling that the excursion had most appropriately concluded this most successful Conference meeting.

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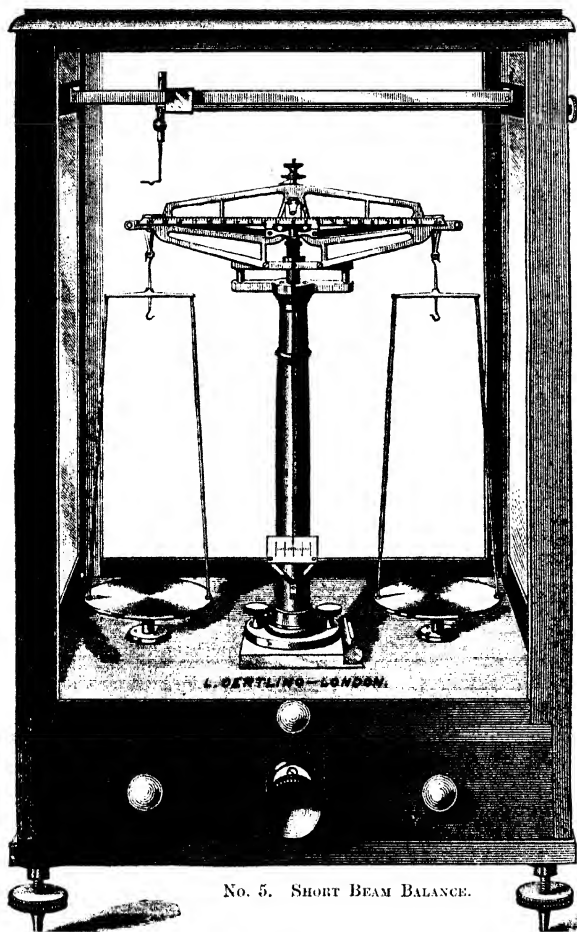
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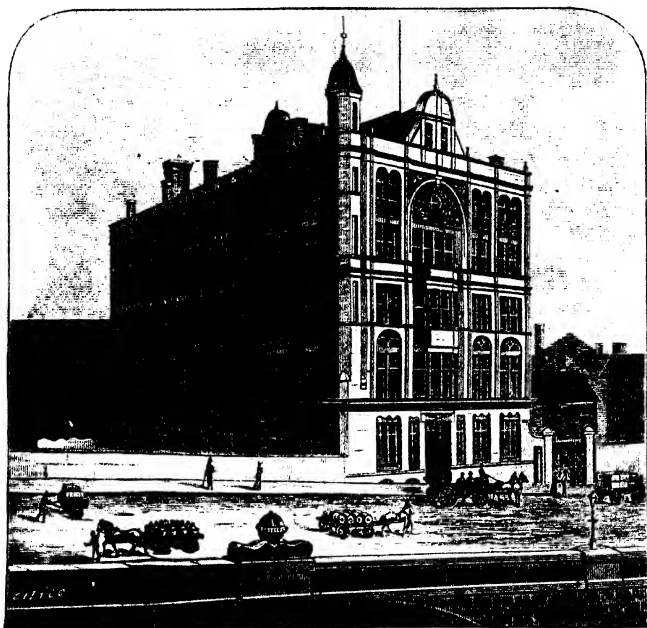
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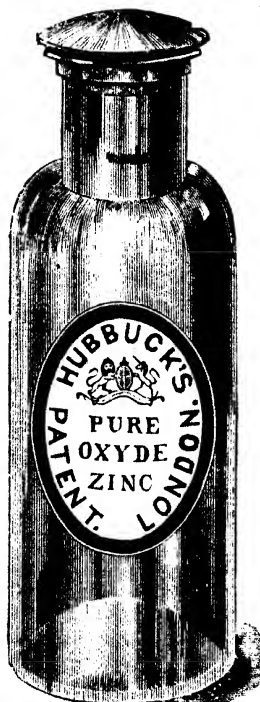
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For the cure of Coughs, Colds, Influenza, Hoarseness, Bronchitis, Incipient Consumption, and affording the greatest relief in advanced stages of the Disease. In Bottles at 1s. 1½d., 2s. 9d., 4s. 6d., and 11s. Also, Cherry Pectoral Lozenges for Coughs, &c., 1s. 1½d. and 2s. 9d.

BRADLEY & BOURDAS, 48, Belgrave Road, and 6, Pont Street, Belgrave Square, London, S.W.; and may be had of all Chemists.
 Telegraphic Address, "Bourdass, London."

*POULTRY, PIGEONS. THE BEST MEDICINE.***FOSTER'S PEARL-COATED ROUP PILL.**

Recommended in "Live Stock Journal."

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EWBANK'S ROYAL PLATE POWDER,

For Silver and Electro Plate.

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BULLOCK'S PEPSINA PORCI.

DOSE—2 to 4 grains.

BULLOCK'S ACID GLYCERINE OF PEPSINE.

DOSE—1 to 2 drms.

In this preparation advantage has been taken of the solubility of Pepsine in Glycerine to produce a convenient and desirable *liquid form* of this valuable medicine; whilst the preservative qualities of the menstruum confer upon the Acid Glycerine of Pepsine the property of keeping for any length of time.

May be prescribed with most substances compatible with Acids. In 4-oz., 8-oz., and 16-oz. Bottles, and in Bulk.

The published experiments of G. F. DOWDESWELL, Esq., M.A. Cantab., F.C.S., F.L.S., &c., Dr. PAVY, Professor TUSON, the late Professor GARROD, Dr. ARNOLD LEES, and others, conclusively demonstrate the excellence, high digestive power, and medicinal value of the above preparations.

* * In prescribing either of the above preparations, it is suggested to insert in parenthesis as follows (BULLOCK).

J. L. BULLOCK & CO.,
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Chemical Food, or Parrish's Syrup.

* * Each teaspoonful contains 2 grains of Phosphate of Iron and Lime, with smaller proportions of the Alkaline Phosphates all in perfect solution. One or two teaspoonfuls at mealtime.

Syrup of Biphosphate of Iron and Manganese.

Syrup of Biphosphate of Iron.

Syrup of Biphosphate of Lime.

Syrup of Biphosphate of Zinc.

Syrup of Hypophosphite of Iron, Quinine, and Strychnine.

Syrup of the Superphosphate of Iron, Quinine, and Strychnine.

Syrup of Hypophosphite of Iron.

Syrup of Hypophosphite of Lime.

Syrup of Hypophosphite of Soda.

Compound Syrup of Hypophosphite of Iron and Lime.

Syrup of Pyrophosphate of Iron.

Syrup of Bromide of Iron.

Syrup of Iodide of Quinine.

Syrup of Iodide of Iron and Quinine.

Syrup of Peracetate of Iron and Quinine.

Solution of Peracetate of Iron.

Do. Glacial.

Clinical experience has proved that this preparation contains Iron in the most assimilable form.

Solution of Peracetate of Iron and Quinine.

COD LIVER OLEIN.

This preparation is prepared from the finest Newfoundland Oil, containing all the active principles, without its impurities, and will be found to agree with the most delicate stomachs.

Phosphorised Cod Liver Olein.

Cod Liver Oil with Quinine.

Cod Liver Oil with Iodide of Iron.

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SYRUP OF HYPOPHOSPHITE OF IRON AND QUININE.

This preparation has been successfully given in Hysteria, Epilepsy, Spermatorrhœa, and other exhaustive derangements of the Nervous System.

DIALYSED IRON.—Dose, 10 to 30 minims in water.

Proprietors of the City of London Cough Lozenges and Pills, Toothache Annihilator, No More Corns (all Registered): and Antiseptic Saline.

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CHEMICAL MANUFACTURERS,
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THE NEW PRESERVATIVE,
SEMPER-DULCIS OR EVER-SWEET,
For Milk, Butter, Cream, Sausages, etc., etc.

(FINEST BUTTER COLOR
(BUTTERCUP BRAND).)

ACIDS OF ALL KINDS.
GRANULATED EFFERVESCENT PREPARATIONS.

Buyers should send for Quotations.

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TRADE.

For destroying Weeds, Moss, etc., on Garden Walks, Carriage Drives, Roads, etc.

We desire to point out the special advantages which the sale of our "Acme" Weed Killer affords the Trade.

1. The "Acme" Weed Killer is used in the gardens and on the estates of the Gentry in nearly every town in the Kingdom.

2. Our Retail Prices are such as will induce a ready sale, and we make no charge for 1 and 2 gallon tins.

3. We pay carriage on six 1-gallon tins, or on four 2-gallon tins, and on 10 gallons in drums and upwards.

4. Drums are charged at cost price. Full price allowed when returned.

5. By taking a 40-gallon cask, and retailing it in small quantities, the Retailer makes upwards of 140 per cent. profit.

Trade Terms on application.

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Testimonials received from Mr. HEAD, Crystal Palace; Mr. IERWIN LYNCH, Cambridge Botanic Gardens; and others.

The "Acme" Weed Killer, for Cheapness and Efficiency, has won for itself a Name throughout the Kingdom far above all others.

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Wholesale Agents in London, Manchester, York, Newcastle-on-Tyne, Edinburgh, Glasgow, Belfast, and Dublin.

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Have gained a High Reputation everywhere. **FOR EXPORT TRADE**, they are put up in 1-lb., 2-lb., and 5-lb. Bottles. Packed in Casks or in 1-doz. Cases as required, and delivered F.O.B. at any Port in England. These Sweets are absolutely pure.

We specially recommend

Lime Fruit Tablets, Everton Toffee, Mixed Fruit Drops, Cough Drops, Raspberry Drops, Lemon Tablets.

CHERRY BLOSSOM LOZENGE.

The most delightful and delicately perfumed Lozenge ever produced.
 Have an immense Sale.

COMPRESSED CHLORATE OF POTASH PELLETS,
SACCHARINE PELLETS,

And PELLETS of every description, put up in 1-lb. White Flint Glass Bottles, with Box-wood Top Corks. Bottles not charged.

HIGH-CLASS LOZENGES

OF EVERY DESCRIPTION.

Chlorodyne Cough Lozenges, Chlorodyne Jujubes, Peppermint Lozenges,

In every variety of size and strength. Curiously Strong, and Multum in Parvo Mints give the utmost satisfaction. Medicated Lozenges of Pharmacopœia Strength.

DIGESTIVE TABLETS. VOICE AND THROAT LOZENGES
 for Singers and Public Speakers.

ORIGINAL SUGAR WORM CAKES

Have an immense sale, both at home and abroad; will keep in any climate, and give entire satisfaction. Put up in Tins, containing 3 doz., 6 doz., and 12 doz. cakes.

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(As per T. H. Pharmacopœia).

All Lozenges are sent out in 2-lb. and 4-lb. Bottles (bottles free), but allowed for if returned.

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ACIDS—pure and technical. Acetic, Benzoic (from Gum), Hydrobromic, Hydrochloric, Hydrocyanic, Hydriodic, Lactic, Nitric, Sulphuric.

ACETATES—Ammonium, Iron, Sodium, Potassium, Zinc, etc.

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THIOCAMB—Dr. J. Emerson Reynold's new disinfectant (Camphor, Sulphur Dioxide, Eucalyptus, etc.).

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PRECIPITATED CHALK.

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Purest and Whitest Quality. Cheapest Sellers in the Market.
Chemicals, Drugs, and Oils.

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H. ERHARDT & Co.

9 & 10, Bond Court, Walbrook,
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CHEMICALLY PURE TINFOIL, ALL TIN.
Untarnishable in any Climate.

VEGETABLE PARCHMENT.
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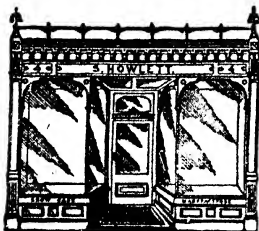
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ALL SUPPLIED FROM LONDON STOCK.

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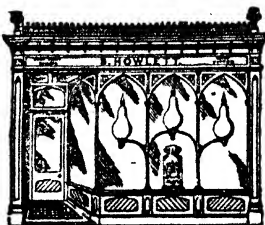
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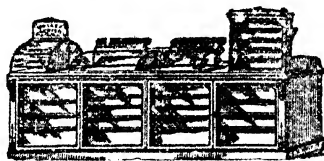
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THE ONLY BOTTLE FREE FROM TUBES, CORKS, OR GROOVES.

"A Real Comfort to the Babe and its Parents."

THE CLIP COVER.

THE CLIP CAP.



THE ANTI-GERM CLIP COVER FEEDING BOTTLE.

IT HAS RECEIVED THE HIGHEST MEDICAL APPROVAL!!

This is an old-fashioned Feeding Bottle, with a simple non-corrosive Clip Cover (patented), superseding the objectionable cork. No air can get into the Bottle except whilst the child sucks.

It has been designed to obviate the dangers incident to the Bottles so much and justly condemned by EDWARD OWEN, Esq., F.R.S., Surgeon to the Children's Hospital, in his Lecture on "The Rearing of Hand-fed Infants," delivered at the Hygienic Exhibition, August, 1884; Dr. West, and others.

Price, Clip Cap, complete, 1s. 6d.; with Clip Cover, 2s. It is made in Four Sizes.

We make the bottle with either a "Clip Cover" or a "Clip Cap." (The latter is safest for night use.)



FIG. 1.



FIG. 2.

PRESTON'S

"ONE CELL" INHALER

(PROTECTED),

FOR CHLORIDE OF AMMONIUM OR OTHER VAPOUR INHALATIONS.

PRICE 3/-.

The simplest, most compact, and effectual Inhaler extant. Gives a perfectly neutral vapour.

May be used for the Inhalation of Chloride of Ammonium, or for any Volatile Medicament, simple or combined.

BOTH THE ABOVE MANUFACTURED BY

J. PRESTON, Chemist,
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AMERICAN BAY RUM,

IMPORTED AND INTRODUCED BY

MICHAEL E. FOSTER,

50, BISHOPSGATE WITHIN, LONDON, E.C.

Retail	1s. 6d.	Wholesale	12s. per doz.
"	2s. 6d.	"	20s. "
"	6s. 0d.	"	50s. "

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Raybould's FURNITURE POLISH.

ONCE
USED

Brightens
Furniture
with little
Labour.



ALWAYS
USED.

In TINS,
1d., 7/- grs.;
STONE
BOTTLES,
1d., 8/- grs.;
3d., 2/- doz.;
6d., 4/- doz.;
1/-, 7/- doz.

Carriage paid on 12 doz., England or Wales, assorted as desired.

P.O.O. or Cheque payable to

FLESHER RAYBOULD & CO.,
Reform Works, Wellington Road,
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STEINER'S VERMIN PASTE
KILLS RATS, MICE,
COCKROACHES.

Sold by all Chemists in 3d., 6d., and 1s. Glass Jars.

Works—LIMEHOUSE, LONDON, E.



ESTABLISHED 1855.

SANFORD & SON, Manufacturers, SANDY, BEDS.

Sole Proprietors of **Sanford's Celebrated RAT POISON**, without doubt the best ever introduced. Price 6d., 1s., 2s. and 3s. per box.

Also **MICE POISON**; cannot be excelled. In Packets, 3d., 6d., and 1s. each.
LIBERAL TERMS TO CHEMISTS.

Wholesale of **BARCLAY & SON, SANGER & SON, NEWBERRY & SON, EDWARDS & SON,**
and others, London.

A. S. LLOYD'S EUXESIS.

FOR SHAVING WITHOUT SOAP, WATER,
OR BRUSH.

CAUTION.

The labels on genuine EUXESIS bear signature of Inventor, A. S. LLOYD, in BLACK INK, and the signature of his Widow, AIMEE LLOYD, in RED INK. Refuse all others.

Manufacturer: AIMEE LLOYD

(WIDOW OF A. S. LLOYD, formerly of 27, GLASSHOUSE STREET),

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*N.B.—When ordering from Wholesale Houses, write
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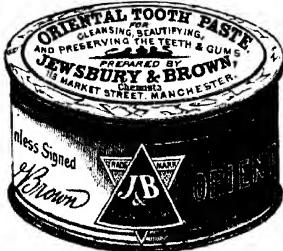
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ORIGINAL AND CELEBRATED

Oriental

Used in the highest circles
over sixty years.

Cleanses, beautifies and preserves
the teeth and gums to old age.



Tooth

White and
Sound Teeth
Insured.

Paste

Keeps perfect in all Climates.

Is distinguished by its extraordinary efficacy in removing tartar; insures to the teeth the most beautiful and pearly whiteness, and induces a healthy action of the gums. Gives peculiar fragrance to the breath, and preserves the teeth and gums to old age.

Pots, 1s. 6d., or double size, 2s. 6d.

CAUTION.—Observe the name and address on the Pots, also the Trade Mark (J. & B. in a double Triangle). Without these none are genuine.

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JEWSBURY & BROWN, MARKET STREET, MANCHESTER;

And of all Chemists and Wholesale Houses.

THE LONDON BRUSH WORKS, AXMINSTER, ENGLAND.

COATE & CO.,

in publishing a new edition of their Illustrated Price Current, tender their best thanks for the favours received for a period of 44 years.

During which time, by the patterns registered and processes patented, specially, the White Enamelled Cement, the Machinery applied, the New Machines invented, involving entire new departures in the manufacture of Tooth Brushes, etc., they believe they have taken the lead in improving the Manufacture of Tooth Brushes more than all the other Tooth Brush Makers in the world put together, whose main efforts seem to have been that of trying to imitate the style and patterns of COATE & Co., but with very imperfect success as yet.

For, as a true test of the superiority of their manufacture, COATE & Co. can say that at the present moment their customers in the capitals of the world are now supplying many of the crowned heads, princes, nobles, and rulers of Europe, Asia, Africa, and America, with Tooth Brushes made by COATE & Co.

Such being our present position in this Branch of Manufacture, we beg to assure our friends and customers that no effort or capital will be spared to hold our position and merit their continued support and approval.

We beg especially to call the attention of our customers to several new patterns of Tooth Brushes now appearing in the new edition of our catalogue, as patterns never yet made by any other manufacturer, and some of which, we think, will command a good sale. We would also note that our Anticurious patterns, specially, A, B, C, D, which were registered by us for the 1851 Exhibition, now 41 years ago, are still popular patterns, and sell well, being most effective in cleansing between the teeth without irritating the edges of the gums.

We hope and think that the actual-size Illustrations now issued, will greatly assist our customers at the retail counter, and facilitate orders per letter at home and abroad.

The drawings of each pattern signify actual size and shape, not hardness, except the patterns G H (Goat Hair), V S (Very Soft), V H (Very Hard), Y, for Yellow or Unbleached Hair, B H (Badger Hair), and C B H (Common Badger Hair). All the other patterns are made and sent out in Soft, Medium, and Hard, assorted, unless ordered to the contrary.

If best Tooth Brushes are ordered by the gross assorted, with a remark as to hardness, preferable or objectionable patterns, a better and more variety can be had than if ordered by one or two dozen per No. Observe, no Sponge Brushes, Palate Brushes, Very Soft or Very Hard, would be sent unless specially ordered to be sent in such gross, and customers who order Assorted Patterns can rely on having a nice assortment sent at once; but, when ordered to pattern, more time may be required, for although COATE & Co. held in stock on January 1st, 1892, nearly four thousand gross of Tooth, Hair, and Nail Brushes, made and partly made, yet the variety of Patterns, Qualities, and degrees of Hardness are so great that they cannot at all times keep up a large quantity of each Sort, Pattern, or Hardness.

THE FOLLOWING ARE A FEW OF THE PRICES OF OUR MERCHANTABLE TOOTH BRUSHES:—

	Per doz.		Per Doz.
C Cemented	2/-	Warranted Best, stamped with Royal	
Cemented	2/6	Arms	5/3
Cemented London	3/-	Extra Best, stamped with Trade Mark	
Cemented Improved	3/6	and "Coate & Co., London"	6/6
Cemented Warranted	4/-	5 Rows	4/-; 6/-
Cemented Warranted Extra	4/6	5 Rows, extra best and to pattern	5/-
Cemented Superfine, stamped with			
Elephant	5/-		

All the above qualities are sent out assorted in patterns and hardness, except the extra best, which only can be sent to pattern.

**N.B.—A Large Stock of Finished TOOTH BRUSHES, HAIR
BRUSHES, etc., kept ready for Merchants' Shipping Orders.**

**ILLUSTRATED PRICE LIST SENT FREE ON
APPLICATION WITH BUSINESS CARD.**



PARIS,
GOLD MEDAL,
1887.



AND AT
PHILADELPHIA,
1876.



**E. H. THIELLAY'S
RENOWNED HAIR DYES,
AND OTHER HYGIENIC SPECIALITIES.**

**EAU FONTAINE DE JOUVENCE, GOLDEN;
OR, GOLDEN HAIR FLUID.**

3s. 6d., 6s., and 10s. 6d. per bottle.

ALSO E. F. JOUVENCE IN EVERY SHADE.

Wholesale Descriptive Price List on application.

COMPANION to the E. F. JOUVENCE.

A Delicious Oleo-Fragrance, to fix the tint after operation. 2s. 6d., 4s., 5s., etc.

EUCALYPTIA (Registered, 1867).—From *Eucalyptus Globulus*; powerful Stimulant for debilitated hair. 2s. 6d., 3s. 6d., 4s. 6d., 7s., and 10s.

CELEBRATED MOUSQUETAIRE.—For the special training and cultivation of the Moustache. Quite a novelty. Wonderful success! Invaluable to Medical Men attending Hospital Wards, checking malarious and generally vitiated air from the respiration. In case, with implements, at 2s., 3s. 6d., 5s., 7s. 6d., and 10s.

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Shippers and Merchants supplied on the usual terms, and at a considerable reduction for Export in Bond.

DINNEFORD & CO.,

MANUFACTURERS OF

Horse-Hair Friction Gloves, Belts, Bath Brushes,
Oxford and Cambridge Pads, etc., etc.

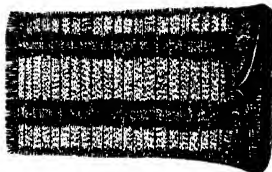
In white, grey, and black hair, of various degrees of hardness, to suit the most delicate,
without risk of injury to the skin.

WHOLESALE PRICE LIST.



**LADY'S AND GENT'S FLESH
GLOVE (in Pairs).**

No. 1 size, 36s.; No. 2, 40s.; No. 3, 42s.
per doz. pairs. Retail, 5s. each.



**PRINCE OF WALES BATH
GLOVE.**

For wet or dry use. 21s. per doz. Retail,
2s. 6d. each.



CLARENDON FLESH RUBBER.

Hair on both sides. One surface is soft, the
other hard; either may be used for friction.
21s. per doz. Retail, 2s. 6d. each.



ARMY BATH PAD.

For wet or dry use. Hair on both sides.
A luxury for the Bath. 12s. per doz.
Retail, 2s. each.

OXFORD WASHING PAD.

For cleaning and softening the hands, and for the Bath. In one doz. boxes. 8s. per doz.
Retail, 1s. each.

**ALEXANDRA BATH
BRUSH.**

Hair on both sides, on a long
handle. 21s. per doz. Retail,
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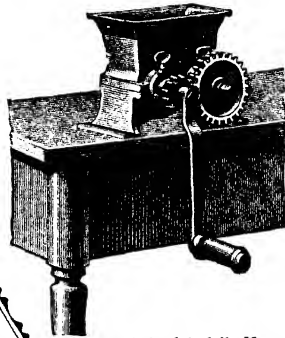
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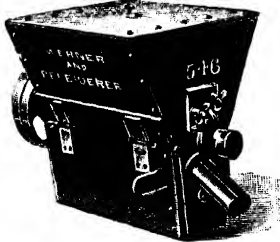


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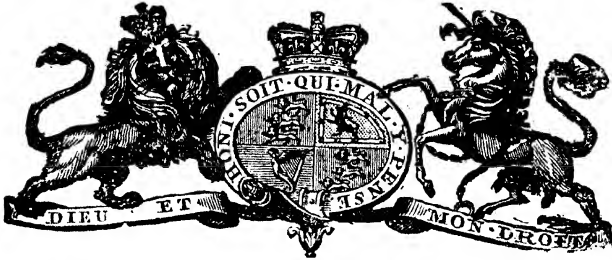
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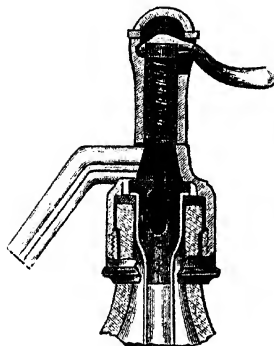
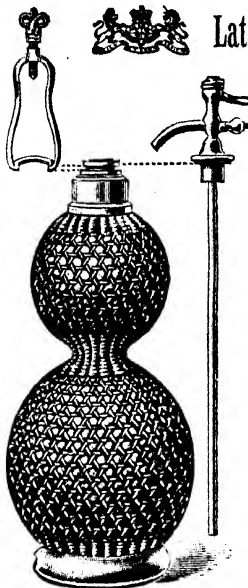
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